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CONVERSATIONS

ON

ANATOMY, PHYSIOLOGY,

AND

SURGERY.

BY

A. ROBERTSON, M.D.

LECTURER ON THE PRACTICE OF PHYSIC.

First American Edition, with Pathological and other Additions.

IN TWO VOLUMES.

VOL. I.

Philadelphia:

PUBLISHED BY TOWAR & HOGAN,

No. 255, *Market Street.*

1828.

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BE IT REMEMBERED, that on the twenty-eighth day of January in the fifty-second year of the independence of the United States of America, A.D. 1828, Towar & Hogan of the said district have deposited in this office the title of a book, the right whereof they claim as proprietors, in the words following, to wit:

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In conformity to the act of the Congress of the United States, entitled, "An act for the encouragement of learning, by securing the copies of maps, charts, and books to the authors and proprietors of such copies during the times therein mentioned;" and also to the act, entitled, "An act supplementary to an act, entitled, 'An act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL,
Clerk of the Eastern District of Pennsylvania.

TO

THE GENTLEMEN

ATTENDING

THE ANATOMICAL AND SURGICAL LECTURES,

THIS LITTLE WORK IS DEDICATED,

WITH MUCH RESPECT,

AND BEST WISHES,

BY THEIR MOST OBEDIENT SERVANT,

ARCHIBALD ROBERTSON, M.D.

[iv]

PREFACE.

NOTWITHSTANDING the numerous Manuals of Anatomy in the hands of Anatomical and Surgical Students, it occurred to me that something of a concise and more practical form was still wanted. In consequence, I have employed my leisure hours in composing this small Treatise, in which I have endeavoured to give a correct Epitome calculated to instruct those anxious of acquiring practical knowledge, and also to refresh the memory of Practitioners, who have little leisure to read voluminous works. The conversations are conducted in a manner deemed the best for conveying necessary information to my readers, and in a style familiar and plain.

The organic derangements of the different parts are shortly pointed out; and the diseases occasioned by, or inducing, them are enumerated,

without entering into any particular description of them, which would have been foreign to my present purpose. These are generally placed after the Anatomical, Physiological, and Surgical descriptions of the different organs.

I have not scrupled to make repetitions, when they seemed to be requisite for impressing important facts upon the mind of my young readers. For their assistance also, I have frequently marked the accentuation of words most apt to be mispronounced, without any view of dictating to those advanced in their studies, and familiar with Anatomical phraseology.

It is presumed that this concise Treatise, besides being an agreeable and useful pocket companion to Anatomical and Surgical Students, will also be found well adapted to the purposes of those who read for general information.

CONVERSATIONS

ON

ANATOMY, PHYSIOLOGY,

AND

SURGERY.

PHYSIOLOGICAL PRELIMINARIES.

Q. WHAT are the elements which compose the substance of animals?

A. They are either solid, liquid, gaseous or incoercible. The solid elements are sulphur, carbon, iron, manganese, lime, soda, magnesia, silex, alumen and phosphorus. The liquid elements are water, which forms three parts of the animal, and muriatic acid. The gaseous are, azote, hydrogen, oxygen. The incoercible are light, caloric, electricity and magnetism.

Q. Are these substances found existing in the animal body in a pure, or in a combined state?

A. They are combined with each other; three and three, four and four, &c. and thus form the immediate principles of animals: thus the azotized principles are, albumen, fibrine, gelatine, cheese, mucus, urea, uric acid, osmazome and the colouring principle of the blood: The non azotized principles are, the acetic, benzoic, lactic, oxalic, formic and rosacic acids, sugar of milk, su-

gar of diabetes, the yellow colouring principle of the bile, cantharidin, spermaceti, biliary calculus, the odorous principles of amber, of musk, of castor, of civet, and the two fatty principles discovered by Chevreuil.

Q. What are these substances called?

A. They are called the organic elements of the system, for by their combination with each other are formed the different structures of the human body.

Q. What are those structures or tissues called?

A. 1.		Osseous	
2.		Vascular	Arterial, Venous, Lymphatic
3.		Nervous	
4.		Cellular	Cerebral, Ganglionic
5.	Systems	Fibrous	Fibrous, Fibro-cartilaginous, Dermoid
6.		Muscular	Voluntary, Involuntary
7.		Erectile	
8.		Mucous	
9.		Serous	
10.		Horny or epidermic	Pilous, Epidermoid
11.		Parenchymatous	Glandular

This is the arrangement of Dupuytren and Richerand, and is the most comprehensive. These structures combined with and acting on the fluids form the instruments by which life and all its functions are performed: When several organs are united, they form an apparatus, the number and distribution of which constitute the difference between animals.

Q. What are the properties of the tissues?

A. They have the ordinary physical properties of bodies; as different degrees of solidity, transparency, elasticity, &c.: besides they have certain properties which are peculiar to them, as extensibility and contractility:

they have also properties when considered as to their composition; as some, as the bones, are principally composed of phosphate of lime; others, of fibrine; others, of albumen: The first are called their physical properties, the second their vital, and the third their chemical: It is the province of *general anatomy*, to study their properties in these three respects.

Q. What proportion of fluid is there in the human body?

A. Nine to one, as has been proved by drying a dead body in an oven.

Q. What are the principal fluids of the human body?

A. 1. The blood; 2. The lymph; 3. The perspiratory fluid, comprehending the cutaneous perspiration, that of the mucous membranes, as of the lungs and intestines; of the serous, the synovial, adipose membrane, medullary membrane, the interior of the thyroid, thymus, &c.; 4. The fluids of the follicles, as the wax of the ear, the fatty substance of the skin, the mucus of the follicles, of the tonsils, of the glands of the cardia, of the prostate, and of the neighbourhood of the anus; 5. Glandular fluids; as tears, saliva, pancreatic juice, bile, urine, the fluids of the glands of Cowper, the semen, milk, the liquid of the renal capsules; that of the testicles, and of the breasts of new born children; 6. The chyme and the chyle.

Q. How are the fluids classified?

A. By some they have been arranged as follows, the chyme, the chyle, the blood, and the fluids which emanate from that fluid. By others, they have been said to be recrementitious, or alimentary; excrementitious, or those which are thrown off from the system, as the perspiration, &c. and lastly those which partake of the nature of both. They have also been classed according to their chemical properties.

Q. What is meant by life?

A. It is a property peculiar to living animals and vegetables, is incapable of definition, and is best known by the enumeration of the structure, the functions and qualities of living bodies in their healthy and diseased states, which are the objects of the following pages.

Q. Enumerate some of the most generally admitted vital properties.

A. 1. The sensibility of the brain, by which the mind perceives external objects.

2. Organic sensible contractility, or what was formerly denominated irritability, as evinced in the vermicular motion of the intestines, in the contractions of the muscles after death, and of the heart.

3. The contractility of the muscles obedient to the will, called by the French the contractility of relation, or animal contractility.

Q. Are there no others?

A. Some physiologists enumerate two, viz. organic or vegetable sensibility, or that quality by which the particles of bodies are united to form the vegetable or the animal; and insensible organic contractility by which the fibres are formed: but as they regard operations beyond the cognizance of the senses, it is evident that they are entirely hypothetical.

Q. What are the functions of the human body generally considered?

A. 1. Those of mind and its instruments, the brain, senses, and muscles, &c. or those by which our relations with external nature are kept up, called by the French the functions of relation; 2. The nutritive or assimilating functions; 3. Those of generation. As the first thing in order is to describo the anatomy previous to the detail of the peculiarities of each function, we proceed, after a few preliminaries, to give the anatomy of the body in all its parts, describing after each its physiology and pathology.

PATHOLOGICAL PRELIMINARIES.

EXPOSITION OF THE VARIOUS METHODS OF EXAMINATION USED IN MEDICINE.

Q. Upon what does the success of the science of medicine depend.

A. Medicine, which may be termed a science of facts, is indebted for its present distinction to observation, and on it must depend for its further advancement. To observation the physician owes the most exact and valuable parts of his knowledge, and upon it he rests the basis of his diagnosis, prognosis, and treatment of disease. As then observation is, at once, the surest pledge of the future improvement of the healing art, and the safest guide to those who practise it, we must see at once the necessity of applying diligently to its cultivation.

Q. Where are observations best made?

A. It is at the bed-side of the patient that the observer must study disease; there he will see it in its true characters, stripped of those false shades by which it is so frequently disguised in books. There, freed from the vagueness and illusion of systems, the student can acquire fixed and defined notions of diseases, and learn the difficult art of distinguishing them. If physicians had always confined themselves within the limits of strict observation—if they had restricted themselves to such conclusions as are fairly deducible from facts, the science of medicine would not now be overloaded, as it is, by hypotheses, and we should possess a sufficient body of materials to enable us to establish sound general principles.

Q. Is observation the sole requisite?

A. Though clinical studies are necessarily long and laborious, still they should not discourage the young observer; they will amply requite him for his pains. Let it not, however, be supposed that observation is to be confined to the mere acquisition of facts: it will be of

comparatively little value unless directed by reflection. To observe Nature is not enough; she must be interrogated, if we wish to wrest her secrets from her, and acquire at the same time the means of communicating to others the result of our researches.

Q. What are the more conspicuous improvements in assisting observation of the present day?

A. The improved means of investigating diseases which have been devised of late years, by rendering the methods of examination more strict and rigorous, have given a very decided impulse to medicine. Pathological Anatomy has raised it to a level with the descriptive sciences, when considered in reference to organic alterations, and the "Auscultation Mediate" has placed it amongst the physical sciences, so far as the doctrine of symptoms is concerned. Every well informed person now admits that the discovery of Laennec has effected for medicine what Petit and Desault have already done for surgery. For if a catheter, introduced into the bladder, gives an assurance of the existence of a foreign body in that viscus, pectoriloquy is a no less decisive test of the presence of a preternatural excavation in that part of the lung in which it is perceived.

Q. Does not the science still labour under great uncertainties?

A. Notwithstanding the advances that have been made in the investigation of diseases, particularly those of the brain and its investments, and those of the chest and digestive organs,—notwithstanding the improvements that have followed the researches of Laennec, Broussais, &c. &c., we cannot deny that many points remain immersed in obscurity, and that several questions of primary importance continue undecided. As, however, it is by observation alone that these and other difficulties can be removed, it cannot fail to be instructive to inquire what are the qualifications necessary to be possessed by those who engage in the difficult undertaking of correcting erroneous impressions concerning the doctrine of diseases, and removing the obscurities that beset them.

OF THE OBSERVER.

Q. What preparatory studies are necessary?

A. Whoever wishes to extend the boundaries of Medicine should commence his education by acquiring a perfect knowledge of the Greek and Latin languages, and should then proceed to learn the modern languages, particularly the French, Italian and German. This is necessary to enable him to study with effect the many excellent works published by our neighbours; and (should he visit those countries) to observe with advantage their clinical practice, and form an accurate estimate of their modes and principles of treatment.

The observer should acquire correct ideas of several sciences which may be deemed accessary to medicine. He should be acquainted with Chemistry, Natural History and Natural Philosophy, as he will constantly have occasion to make application of their principles; and if he be ignorant of them, many physiological and pathological phenomena will appear altogether unintelligible.

Q. What are the sciences more strictly medical?

A. The sciences more strictly medical, and therefore indispensable, are General Pathology, Physiology and Anatomy, particularly the anatomy of the tissues and viscera in their healthy state, which has hitherto been too much neglected, and which has begun to be properly regarded only since pathology has been more carefully studied. How can any person know a particular tissue to be diseased, if he be ignorant of its characters in its healthy state? How can he distinguish the effects of disease from those changes which occur after death has taken place, if he does not possess correct notions of each, and of the anatomical characters which are peculiar to them? Until anatomy is studied in this way, disputes and controversies will go on, as they have hitherto done, and medicine will make no real progress towards improvement. These remarks apply with at least equal force to pathological anatomy, without a

knowledge of which it is quite impossible to give precise and detailed statements of the various alterations of which the tissues and organs are susceptible, or avoid confounding the different structural lesions which occur in them.

These, however, are not the only requisites which an observer should possess. He should be acquainted with Materia Medica, Surgery, "Hygiene;" and, above all, Pathology, without which he can establish no claim to the character he assumes; and still it is by observation only that he can become a pathologist. Hence the second part of this work is calculated to remove some of the difficulties that stand in the way of the young observer, by giving such an exposition of the characters and diagnosis of diseases as will enable him to prosecute his studies with effect.

Q. What farther requisites are necessary for the successful study of medicine?

A. In order to draw up correct histories of cases, it is not sufficient merely to observe the phenomena which they present during their progress; they must be observed accurately; and he who expects to do this must possess many requisites both of tact and discrimination, which can be acquired only by a *long and regular* attendance on clinical practice.

Q. How should a case be stated?

A. A statement of a case should not consist of a mere detail of such symptoms as accident has caused to be perceived, nor of a confused, unconnected enumeration of them. It requires no small degree of sagacity to group them together according to the relations which subsist between them, so as to refer them to a common centre, or to a derangement of some particular function or organ, and thence ascend to a knowledge of the seat and nature of the affection of which they are characteristic.

Q. Is the observation of medical phenomena difficult?

A. It is quite impossible for an inexperienced person to appreciate the many shades of difference which dis-

eases assume. How can his unpractised eye distinguish a mere accidental phenomenon from a leading symptom, a remote sympathy from a direct effect, or an insignificant circumstance from that which should constitute the very basis of his indication of cure? If he cannot assign their respective values to all these circumstances, how can he derive any advantage from the facts which he collects? or how can his reports be ever considered as exact descriptions of the diseases he has seen? A statement of a case can never be useful to him who makes it, or profitable to Science, unless it be a faithful transcript of the phenomena that have occurred. For if it be not correct in all its parts, it will but mislead the judgment and confirm error; whilst exact facts, on the contrary, strengthen the judgment, and contribute to the establishment of an exact Science. When such results as these follow from the mere fact of the observer's knowledge being inadequate, what must be the consequence, if it be but a mass of falsity and error?

Q. What are the results of inaccurate observation of medical phenomena?

A. Instead of transcribing a faithful history of the diseases presented to him, he will give an incorrect and inadequate account of them, and the only result of his observations will be, to lead to false theories, which may be considered as so many pathological romances that have long retarded, and still retard the progress of Medicine. Even under the most favourable circumstances, such a person can only attain an imperfect mode of examination; the degree of its imperfection will of course be lessened in proportion as he acquires a better knowledge of pathology, or has opportunities of observing, and reflecting on, the facts collected by others: hence we can generally form an estimate, on reading a case, of the degree of knowledge possessed by the person who has detailed it. But these are not the only sources of error to be guarded against.

Q. Are there any other defects to be obviated in studying medicine?

A. It will be found necessary to review such re-

ports and observations as had been made during the earlier years of study, which are generally incorrect or incomplete. This is not done for the purpose of supplying their deficiencies, or correcting their errors, but, in order to guard against any erroneous impressions they may have left on the mind,—impressions which, in too many instances, have exerted an injurious influence on the whole course of men's professional career.

Q. What other assistants are necessary?

A. Correctness and discrimination are qualities indispensably necessary for a physician; and these he can only acquire by constant exercise and observation, which will so sharpen his senses and faculties, that he will seldom fail to seize and appreciate symptoms and phenomena which escape the notice of others. But it is not sufficient that the senses should be thus exercised, as we know that there are many minute circumstances that will escape them; hence the necessity of assisting them by certain auxiliaries. Thus it is that certain alterations of structure, which are not perceptible by the naked eye, are rendered manifest by a lens or a microscope; and a virus, which cannot be detected by our senses, or even by chemical tests, becomes evident by inoculation.

Q. Are there any others?

A. Each of our senses being adapted for special purposes, all of them are made to render important service to medical inquiries, and ought to be employed concurrently in conducting them. Percussion, and still more auscultation, have clearly shewn the great value of one sense, that hitherto was seldom directed to this sort of investigation: in a word, by the eye we can distinguish small-pox from cow-pock; by the ear, ascites from tympanites; by the smell, gangrene of the lung from phthisis; by the taste, diabetes mellitus from simple pththisuria; by the touch, aneurism from various other tumours.

Q. What qualities of mind are necessary?

A. The observer should possess penetration, not subtlety; sagacity, to follow the thread of a narration too often obscure; discernment, to overcome the obstacles

which false modesty or want of candour may throw in his way; a sober judgment, to form just ideas of the impressions conveyed by his senses; correct reasoning powers, that he may deduce no conclusions but such as fairly follow from the premises; perseverance, that he may not be discouraged by the difficulties that stand in his way; and lastly, resolution and humanity to disregard the danger of contagion, as he does the disgust and risk of the dissecting room.

The observer should not allow any circumstance of a case, however trivial it may appear, to escape him. He should be free from prejudice and prepossession, if he wishes to avoid giving to his observations an erroneous direction, and impressing on his statements the bias he has contracted. He should see things as they really are, not as he may wish them to be. He should always recollect that the slightest error or negligence may be injurious, not only to himself, but also to those who repose confidence in his statements. The duty of an observer is that of an historian; from that he should not depart, his chief merit is correctness and fidelity.

But if even experienced persons have to contend against difficulties such as are here mentioned, we can readily see what care and exertion are required on the part of those who are just entering on their clinical pursuits. Hence the necessity of their receiving a regular course of instruction, which, while it fully impresses their minds with the importance of the pursuit in which they are engaged, may point out to their notice the various phenomena that present themselves, and indicate their relative value and connexion. A system of clinical instruction so conducted should be considered as indispensable in every hospital which is resorted to by students. "Life is short, and Art is long," says the father of Physic. No man can see every thing by himself; but reading will make him acquainted with the observations of his predecessors and contemporaries, and enable him to profit by their experience; in fact, it becomes an imperative duty to read and study, as a most efficient means of acquiring new and useful information; but if

this be not a sufficient incentive, then it should be recollected, that if we do not read, we run the risk of being left behind by others, and that our knowledge is receiving no addition, while theirs is progressively advancing.

The observer should be scrupulously exact in his descriptions and statements. He should, above all things, be impressed with that integrity and love of truth which are indispensable to a physician. The mere gratification of self-love should give way to considerations of higher consequence, and which concern so nearly the interests of humanity.

Q. Enumerate some of the means by which these qualities of mind are to be acquired?

A. One of the most efficient means of acquiring these different attainments, and becoming skilful practitioners, is, when we see a particular case, to consult the writings of those who have treated expressly upon the disease to which it is referred. The work will then be studied with advantage, when we have an example before us with which we can compare its descriptions, &c. In this way, precept and practice are made to go hand in hand, tact and discretion are acquired, and the experience of those who have already distinguished themselves is made to supply our deficiencies in this particular. We should not, however, follow this course as servile imitators. We must exert our own discretion, for though we find much to approve, we shall meet with something to condemn; while we adopt the one, we appropriate to ourselves part at least of the spirit of our masters; when we reject the other, we feel reason to distrust ourselves, seeing the errors into which our predecessors have fallen. When the mind is disciplined in this way, the scope of its inquiries will be greatly expanded, and a new importance be given to circumstances previously regarded as insignificant. It is on this principle that such great advantage is derived from reading the works of the ancient physicians, who paid so much the more attention to the signs and symptoms of diseases, as they had not the lights of pathological anatomy to guide them.

Q. With regard to the demeanour to be observed towards the sick what is to be said?

A. We may here conclude these remarks, by saying a few words on the demeanour which ought to be observed toward sick persons in order to gain their confidence, and obtain the disclosures which are necessary to form a proper decision on their cases. The physician should be calm and conciliating, should hear with attention the communications which his patients make, should put his questions to them with mildness, listen kindly to their complaints, and never fail to demonstrate an active interest in their welfare.

OF OBSERVATION IN GENERAL.

Q. On what does the science of medicine rest?

A. The basis of medicine, says Baglivi, rests altogether on observation—*Ars Medica est tota in observationibus.* But the facts which observation presents should be collected with care, method, and discrimination. According to the object which an inquirer proposes to himself, observation may be general or special. It is termed *general*, when directed to ascertain the general phenomena; for instance, of sporadic, endemic or epidemic diseases; and *special*, when confined to single cases, collected at the bed-side of the patient; it is to this latter that our attention for the present is directed: the former shall be treated of when we come to consider the subject of medical constitutions.

Q. What is the advantage of the first kind of obsertion?

A. Special observation has this marked advantage, that when a number of cases are detailed with judgment and fidelity, and every circumstance of them carefully noted, they present to us the different characters which a disease puts on in several individuals, which will always give to Monograph Works a decided advantage over general treatises.

Q. With regard to the language of description what is to be observed?

A. In drawing up a case, it should always be recollected that it is done with a view to convey to others an exact representation of the facts which we have observed. In order to effect this, the words used, and their various shades of meaning should be carefully considered, so that they may convey to the mind of the reader the facts as they really existed, without adding or suppressing any thing. The report of a case should be like the copy of a picture. It should be so faithful as to preserve all that individuality which marks each particular case, and distinguishes it from every other of the same class. Even when the phenomena of a case are confused and intricate, the observer should still express its real character, and should not seek to make it appear clear and simple, as is too often done; for that can only be effected by misrepresentation.

The statement of a case should not be loaded with superfluous detail; it should contain what is necessary, or rather what is indispensable; but when the subject is obscure, the details should be extended and minute. In the descriptive part no reflections or opinions should be introduced, as that cannot fail to interrupt the narrative.

Q. In what order should the symptoms be arranged?

A. The leading symptoms, particularly those which serve to establish the diagnosis, should first be noted down, ranged according to their importance, reference always being made, as far as can be done, to the order of their appearance. These should be expressed clearly, so as to impress them on the mind of the reader. If several organs be affected at the same time, the symptoms referrible to each should be collected into separate groups; those which are common to all, or of secondary importance, should follow; and then if the treatment be given, it will be necessary to mark the state of the patient before and after the exhibition of medicine. Superfluous details should, of course, be omitted; and nothing stated but what is indispensably necessary. It may, however, be sometimes useful to note the absence of any particular symptoms which usually exist in similar cases, lest the omission may be attributed

to negligence or forgetfulness on the part of the observer, and so discredit be cast on the facts he has detailed. When a disease is obscure, attention should then be redoubled, particularly if there be any controversies on the subject, and even the minutest details should be noted.

Q. In ascertaining the qualities of medicine, what is to be observed?

A. When therapeutics are the objects of research, and when attention therefore is directed to ascertain the action of particular medicines, it is not necessary to report all the details of the cases; it is enough to state their general nature, and the circumstances of the patient both before and after the administration of the medicine. Its form and dose should be stated, as well as the effect produced; and lastly, some remarks should be made on the state of the patient, when the treatment was discontinued. It is, in general, advisable to say a few words as to the state of the medical constitution, particularly when there exists any endemic or epidemic disease, as it must be evident that a symptom, which under other circumstances would be of no consequence, may then be of considerable importance; for instance, the existence of an epidemic varicella may throw much light on a pustular eruption with a central depression.

Q. What other assistants are useful in assisting observation?

A. In some cases, words cannot convey to the reader all that is necessary to be expressed, particularly in describing morbid appearances, which a disease presents: this can only be remedied by sketching or drawing the parts. To execute our task in this way must necessarily be attended with many difficulties; but a case drawn up with adequate exactness and fidelity becomes a complete monograph. In it we shall find stated the causes and distinguishing symptoms of the disease described, its progress and periods—the treatment adopted and its effects; and the reader may profit almost as much by it as if he had seen it himself.

Q. Is there great uncertainty with regard to the facts of medicine?

A. Nothing more fully proves the absence of sufficient precision in the conduct of observations, than the disputes about facts which we so constantly witness. If the same phenomena be accurately observed, there will be no room for any difference of opinion. Still, when we look over a number of cases, and observe the total want of conformity that there is in the descriptions of the same diseases, as given by different writers, we are often astonished at the discrepancy they exhibit, and feel disposed to consider it as a proof of the uncertainty of medicine, as if the errors of individuals should be laid to the charge of the science they profess. But whence, it may be asked, arises this difference in the reports of the same facts? It arises from the different degrees of knowledge possessed by the persons who have observed them, —from some error in their methods of observation,—from ignorance of the exact meaning of the terms they employ, or from want of attention in the examination of their patients. In fact, let any number of persons describe the same affection, if their judgments be equally correct and matured, if they possess the qualities above mentioned, as being necessary for the proper conduct of observations, and if they be equally well acquainted with pathology, the cases which they collect cannot fail to be marked by the same characters of truth and similitude, and in all we shall at once recognize the complaint described, whether it be arachnitis, pneumonia, peritonitis, &c. But if the disease according to one seems to be pleurisy, according to another pneumonia, a third, phthisis, it clearly follows that the statements are given inaccurately, and that those who have made them are ignorant of the differences which distinguish these diseases one from another.

Q. With regard to copying observations what is to be observed.

A. The observations should be transcribed immediately after the visit, in a book kept for the purpose, as being the only means of ensuring correctness in the statements. Whilst the facts are fresh in the mind, they will be noted down with accuracy; and if any thing be

omitted, it can readily be supplied. But if any length of time be allowed to elapse, it must be at the risk of forgetting some of the leading circumstances, and of giving probably a false colouring to the whole.

Q. When is the diagnosis most properly made out?

A. It is only when the case is concluded, that it becomes necessary to make reflections on the diagnosis,—on any particular circumstances that may have occurred,—on the treatment pursued,—or, finally, on the connections of the symptoms with the organic alterations found after death, if the termination has been fatal. By these means, materials really useful are collected, either for the guidance of our own future practice, or the instruction of others; and so the most advantageous use is made of our experience.

Q. What arrangement of the matter is found useful?

A. In order to save time and trouble in the subsequent perusal of these cases, it will be found useful to place at the head of each of them an abridged summary, containing the distinguishing signs—most important circumstances that occurred during the course of the disease—the plan of treatment pursued, and its effects;—and finally, the organic alterations, if it has ended in death.

The following formula seems well adapted for the purposes here stated. It will enable the observer to arrange his cases, and see at one view their most important phenomena. The clinical reports in the Hotel Dieu are all drawn up in this way.

Case of ———

Year— No.
Month. Residence.

Causes . . . .
Particular Symptoms . .
Duration of the disease . .
Termination . . . . . .
Treatment . . . .
Effects . . . .
Morbid appearances . . .

Q. What is the best style for recording observations?

A. In the first place, care should be taken that the terms employed should convey a precise meaning, and never admit of ambiguity; they should fully express the facts without being strained. It is sometimes preferable to repeat a particular expression, and rather than, by endeavouring to vary it, run the risk of sacrificing clearness. The style should be plain and unaffected, free alike from ostentation as from mannerism. The narrative part should be written with simplicity and ease; but all that relates to the condition of the patient, and to the enumeration of symptoms, had better be given in the aphoristic form; it carries with it a greater degree of precision, as each word expresses an idea. Occasionally, however, it will be found necessary to deviate from this routine, to avoid the sameness that would necessarily be produced by too rigid adherence to it.

METHOD OF EXAMINATION APPLICABLE TO ALL DISEASES.

Though the acquirements here pointed out are varied and numerous, it should not thence be inferred that they are too difficult to be attained. By industry and attention, if properly directed, much may be effected, even in a moderate space of time, and a greater progress may be made than could at the commencement have been expected.

It will here be asked, what course should be pursued in the conduct of our researches? Can we adhere to any fixed and uniform plan? Certainly not. For how could the same method of investigation be made to apply to diseases whose seat and nature are totally different? Would it not be absurd, when examining a case of effusion into the brain, to proceed in the same way as if the effusion were seated in the thorax? And what resemblance can there be between the questions addressed to a person with malignant pustule, and one labouring under scirrhus of the stomach? Surely the means of ascertaining the difference between small-pox and vari-

cella—between hydrophobia and certain nervous affections which stimulate it, must be very different from those adopted when we want to distinguish mania from arachnitis, inflammation of the stomach from peritonitis or gout from articular rheumatism. For it would evidently be irrational to pursue the same routine of examination in diseases so totally different in their seat, nature and character.

Q. What particular parts of the body are particularly necessary to be made the subject of observation?

A. Our methods of examination then should partake of all that precision which marks the improved pathology of the present day; and though they may not be directed in every case to each viscus and tissue, they should invariably be directed to explore each of the great cavities, where the vicinity of the contained viscera, and their numerous sympathetic relations constitute so many fertile sources of error.

Q. But should not the observer always have a direct object in view, in making his examination?

A. Several plans of examination have been pointed out and insisted on; yet we too often find that though after putting many questions without any direct object, the observer may be able to collect a greater or less number of symptoms, he still has acquired no knowledge of the disease about which he is inquiring. Such a course is not merely injurious from the time it wastes, but also by conveying the erroneous impression that the symptoms are to be considered apart from the organ to which they are referrible.

Q. What is the preparatory examination necessary to be made?

A. Whilst examining the general appearance of the patient, and the expression of his countenance, the observer should at the same time ascertain the state of his tongue and pulse, should see the expectoration if there be any, make him respire, and ask whether he feels pain, in any particular part, and if he does, what has been its duration.

In this way, which is particularly useful in acute ca-

ses, a skilful person passes rapidly in review the principal functions of the system, and obtains some idea of the state of the organs contained in the three great cavities, which are generally the seat of all serious diseases. The countenance and general appearance are good indices of the state of the intellectual and muscular systems, the tongue and mouth mark that of the digestive organs, and the pulse indicates either the direct derangement of the organs of circulation, or their connexion with the disturbance of others.—The expectoration, respiration, and voice mark the state of the lungs and their appendages, whilst the seat of the pain of which the patient complains, and the time it has lasted, cast additional light on the information obtained by the previous inquiries.

The observer is still far from having ascertained the precise character of the lesion he is examining, but by means of the distinguishing signs of the diseases of the principal cavities, he will, in the first place, be able to determine whether the affection be acute or chronic; and in the next, by following the plan of examination we are now about to detail, he will learn how to give to his questions that degree of precision which is necessary for strict diagnosis and accurate description. By these means may be avoided that oversight so commonly committed in elementary works, namely, of supposing that to be known which is unknown, and of sending the reader to the perusal of a case, of which he as yet knows not even the denomination.

Q. What appearances are first to be noted?

A. When commencing to take down a case, first note the name, sex, age, and occupation of the patient; this should be done according to the form above given. In some cases it becomes necessary to state the country or district from which the patient comes, and the diseases which prevail there. For example, many cases of intermittent fevers found in Paris got the infection elsewhere, which ought to be noted.

In general, it is advisable to collect the principal facts and circumstances of the case in the presence of

those in attendance on the patient; it tends much to inspire confidence. In Hospitals, pupils should avoid fatiguing those unhappy persons whom misfortune compels to take shelter in such asylums; and when they are seized by any dangerous disorder, surely their own feelings should teach them, that it is worse than inconsiderate to repeat the same questions many times over, and often without any determinate object. It should never be forgotten that misfortune has the strongest claims on the sympathy of every man; and that every principle should prompt us not to expose ourselves to such a censure as Martial passed on one of the physicians of his time—

> Languebam; sed tu comitatus protinus ad me
> Venisti centum, Symmache, discipulis.
> Centum me tetigere manus, aquilone gelatæ
> Non habui febrem, Symmache, nunc habeo.

Q. At what period of the disease is the examination best made?

A. The time of making the explanation is not altogether a matter of indifference. When it is intended to put a number of questions, and enter into all the details necessary for a complete narrative, it is advisable to do so during the period of the remission, as then the patient can better bear the fatigue and exertion of conversation. But when, on the contrary, we wish to observe the symptoms presented by the disease, and the changes induced in the functions, in a word, the actual state of the patient, then it is better to choose the moment of exacerbation, as all the symptoms are more strongly marked, and their relative importance can be more easily assigned.

Q. Do diseases of different intensity require a different mode of examination?

A. The acute and chronic forms of disease require a plan of examination and narration altogether different. Every thing connected with the previous history should be known, and stated fully in chronic cases; it is the

only means of throwing any light on the obscurity which so generally surrounds them. But in acute cases this is far less necessary; it is of very little use, when considering a case of arachnitis, or pericarditis, or when giving its history, to go back to any previous affections of the patient, or inquire what has been his usual manner of living, or what influence any particular agent may have exerted upon him. When the symptoms are urgent, our object is to ascertain speedily the nature and extent of the disease, and meet it by an energetic plan of treatment. Though this principle is true as to the treatment, it is not strictly so with regard to the prognosis, which must be modified by the existence of any particular organic disease, or hereditary predisposition, known to exist in the individual himself, or in his family.

After having examined the different parts of the body, in order to ascertain its external conformation, and any malformations it may present, the existence of which might lead us to suspect others deeply seated; after having ascertained whether there be any venereal or scrofulous cicatrices, which may throw some light on the present affection, the history should then be entered on in full detail, which will be found useful, particularly in consultations.

Q. What other sources of information are to be sought?

A. The inquiries should be directed not only to the patient himself, but also to his family.

A family consists of its ascending, descending, and collateral branches. It is then necessary to know whether there has existed amongst any of these, but particularly in the father or mother, any habitual or chronic disease; such as hæmorrhoids, gout, rheumatism, phthisis, asthma, &c., which may be in any way connected with the present disease, or throw any light upon it. It sometimes happens, that a sort of general disposition to disease is transmitted from one generation to another, in such a way as to determine, in one, gout; in another, phthisis; in a third, some other disease, according as the

occasional causes may tend to develop the one or the other.

The history of the collateral, or even of the descending branches of the family, may occasionally furnish some useful information. Thus we lately had an opportunity of seeing a female, about forty-eight years old, who had been attacked, for the third time, by apoplexy, and whose father, mother, uncle, and two maternal aunts, had died of the same disease. What a prognosis for her! What a dreadful inheritance for her children! When an intimate connexion subsists between the patient and any particular member of the family, it will be useful to ascertain whether there exists also between them any similitude in person, disposition, or habit; it constitutes an additional circumstance to be added to the others; for the closer the physical and moral resemblances between the individuals are, the more likely is the transmission of the disposition to disease.

Q. What questions arise out of the functions of the diseased parts and their derangements?

A. He should pass rapidly over the different periods of the patient's life, observing particularly its septenary divisions, and dwelling on the more important eras, such as infancy, puberty, adult age, and the critical period. He should inquire into the habits, mode of life, and state of the functions at these periods; and ascertain what were the diseases to which the patient had been exposed, such as eruptions of the scalp, cerebral affections, glandular tumours of the neck or abdomen, during the first period of life; measles, small-pox, epistaxis, before puberty; catarrh, hæmoptysis, palpitations, dyspnœa, when the organs of the thorax were assuming a certain degree of preponderance; and lastly he will make inquiries concerning any visceral or functional disturbances that may have occurred during the succeeding periods. It is only by accurate information on all these subjects that we can obtain such knowledge of the peculiar disposition and constitution of the individual, whose case is under consideration, as will enable us to give him advice as to the future management of his mode of living, at the same

time that it throws much light on the plan of treatment to be pursued for his present relief.

A knowledge of the constitution will enable us to foresee in a great measure the form which diseases are likely to assume, and the course they will probably run. According to Professor Récamier, constitutions may be divided into the active, passive, ataxic, and refractory. Observation has shewn that in persons who present the characters of the active constitution, namely, those whose functions and actions are performed with energy and regularity, the return to health is more prompt and easy, and their diseases are more regular and less fatal, if properly treated from the commencement; that in those of a passive constitution, whose functions and actions are feeble, slow, and dull, though still regular, diseases are tedious in their progress, and tardy in their return to health, and consequently have a tendency to remain stationary; that in those, whether active or passive, who are of an ataxic habit, that is, who exhibit in their different vital phenomena, any incoherence, irregularity, or confusion, diseases will present similar characters, will arise from apparently insufficient causes, and often assume such a formidable character as to render it impossible to arrest their progress; lastly, in persons whose constitutions are such as to merit the appellation of refractory, that is, who manifest a certain energy in their functions, with considerable resistance in their disturbance, disease when once excited presents a similar tenacity, and generally resists every method of treatment.

Q. With regard to the temperaments, what is to be required?

A. These have been divided into the sanguineous, lymphatic, and nervous, according as one or other of these organic systems predominates in the economy. By a knowledge of the prevailing temperament, the observer, in the first place, is enabled to know the different affections to which this peculiar organic development disposes; and the reader can more readily

represent to himself the aspect and appearance of the patient.

Q. With regard to idiosyncrasies, what is to be observed?

A. The study of idiosyncrasies is probably even of still more importance, when considered in reference to the peculiar dispositions and susceptibilities of particular organs, and also to the influence which different therapeutic and hygienic agents exert on the system.

It is thus we can see how an organ, too active relatively to others, must be more liable to contract those diseases to which the temperament of the patient already disposes him; how cephalitis, for instance, is more frequent in sanguineous children, in whom the brain is the organ most active and best developed; and thus we can give some explanation of those affections which occur in particular parts, which, though not endowed with much activity, exhibit a peculiar susceptibility for this or that agent; for instance, some persons contract catarrh only when they suffer from cold to the feet, and others get colic during stormy weather. In this way we may pass in review the different organs of the system, and consider them in reference to their predominance of action, their susceptibility relative to climate, seasons, different temperatures, food, drink, exercises, passions, and habitual or accidental diseases, such as issues, or hæmorrhoids; finally, it is only by considerations of this nature, that we can appreciate the advantage of this or that substance, or reject from our treatment a medicine that would be perfectly indicated in similar affections, and have recourse, occasionally, to others, the success of which can only be accounted for by some peculiarity of constitution in the individual.

Q. How is the present affection to be examined into?

A. The observer first seeks to determine the causes which are presumed to have given rise to the disease, if they are appreciable, if not, he has only to state them doubtingly: he then considers the different phenomena that have preceded the attack, the symptoms which ushered it in, the signs which characterize it, its progress,

its influence on the different functions; and, finally, the treatment that has been pursued, and its effects. This plan is peculiarly applicable to acute diseases, and is in fact the only one that need be resorted to.

When the preparatory examination has given grounds for supposing that a certain organ, or system of organs, is particularly affected, we begin by stating the symptoms referrible to it, and then pass successively in review the state of the whole body, comprising the skin, face, state of intellectual faculties, apparatus of sensation, digestion, respiration, circulation, locomotion, secretion, and generation. When we come to treat of the diseases of each of the cavities, we shall give all the details that bear on this part of the subject.

After this is done, it remains only to add the changes that occur from day to day, or at more distant periods, if the disease be slow in its progress. Attention should be redoubled on the critical days; for though the doctrine of crises is almost discarded of late years, it is still supported by the authority of so many ages, that we can scarcely neglect any thing that may throw light on a subject of such importance. When any new medicament is employed in the treatment, its effects should be carefully noted. Finally, the mode in which the disease has terminated should be mentioned, whether it be suddenly, slowly, or by metastasis; so also if it passes to the chronic form, or is followed by another affection. If the patient recovers, his progress to convalescence should be briefly mentioned, as it is always useful to know what influence the disease has exerted in the state of the different functions. But if death takes place, the fullest details should be given of the appearances presented on examination; in doing this, it is not sufficient to describe merely the state of the organs known to be affected during life. If any other tissue or organ present any alteration, it should be fully detailed.

The subjoined tabular view exhibits a summary of all the objects of examination referred to in these remarks.

After having marked the name, sex, age, physical conformation, constitution, temperament, and pro-

fession of the patient, we should pass successively in review—

Previous History.

- History of the Family
  - Ascending
  - Descending
  - Collateral
- History of the Patient
  - During Health
    - Habits
    - Regimen
    - State of Functions
    - Sympathies
    - Constitution
      - Active
      - Passive
      - Ataxic
      - Refractory
    - Temperament
      - Sanguineous
      - Lymphatic
      - Nervous
    - Idiosyncrasies relative to
      - Morbid Susceptibility,
      - Hygienic agents, Medicinal agents
  - During disease, observing the Critical Periods
    - Infancy
    - Puberty
    - Adult age
    - Critical period
    - Old age
- History of the present Disease, considered in its
  - Causes
    - Predisposing
    - Occasional
  - Previous circumstances
  - Attack
  - Progress
  - Termination
  - Present condition

2. Present State	Habit of Body.—The Skin.
	Face.
	Intellectual System.
	Apparatus of Sensation.
	——— Digestion.
	——— Respiration.
	——— Circulation.
	——— Locomotion.
	——— Secretion.
	——— Generation.
3. Termination in	Health.
	Other Diseases.
	Death—Morbid Appearances.

CONVERSATIONS, &c.

OSTEOLOGY.

Q. How are the solids divided of which the human body is generally said to be composed?

A. Into hard and soft parts.

Q. What are denominated hard?

A. The bones and cartilages.

Q. What soft?

A. The muscles, viscera, and all other parts.

Q. How are the fluids divided?

A. Into the chyle, blood, lymph, secretions, and excretions.

Q. By what are the bones bound together in the recent subject?

A. By ligaments and cartilages, and sometimes by concretion.

Q. By what in the skeleton?

A. By their own ligaments, and form what is called a *natural skeleton;* or by wires and plates, to form an *artificial skeleton.*

Q. Do bones present different arrangements of structure in different bones and different parts of the same bone?

A. In the long bones the sides are thick in the middle and thin at the extremities, in the middle of the long bones it is reticular, containing marrow; in the extremity of the larger it is cancellated. The fibres in the long bones of children are longitudinal, in the broad bones radiated, and in the same bones of adults, lamellated.

Q. How are the bones covered?

A. With a membrane called periosteum without; in the long bones within by the periosteum internum, running through the cancellated structure. Their ends are tipped with a smooth substance called cartilage or gristle, for the formation of joints, which last is covered with a membrane called perichondrium.

Q. Of what is the marrow composed?

A. Of fat.

Q. What other circumstances are worthy of note about the bones?

A. Their epiphyses or the ends of bones united by cartilage, and the apophyses, or parts standing out from the body of the bone and united by the same medium, which harden into bone. The epiphyses are called coronoid, condyloid, &c. according to their figures. There are substances also called glands of the joints for the secretion of synovia.

Q. How are the bones of the human skeleton generally divided?

A. Into those of the head, trunk, superior and inferior extremities.

THE SKULL OR BONES OF THE HEAD.

Q. How is the skull divided?

A. Into the cranium and bones of the face.

Q. What is its figure?

A. On the sides flat; smooth on its upper surface, and the general figure of its upper part that of an egg. On its under and outer surface irregular for the origin of muscles and perforated with holes for the passage of vessels and nerves. It is hollow on its under and fore part, and on the back part marked by muscles. Its upper and inner surface is hollow for lodging the brain; and its under and inner surface is also hollow for lodging the cerebellum and lobes of the brain; it is furrowed also on its inner surface by the blood vessels of the brain and dura mater, and covered with sinuosities and pits, the former occasioned by the convolutions of the brain, the latter by the granulous bodies of the dura mater.

Q. What is the texture of the bone?

A. The exterior table is hard, solid, and thick, the internal thin, the middle is cancellated, and called diploë.

OF THE BONES OF THE CRANIUM.

Q. Enumerate the *bones of the cranium?*

A. The *cranium* is composed of *eight bones*, the frontal, two parietal, two temporal, the occipital, sphenoidal, and ethmoidal; the two last are also common to the bones of the face.

Q. What connects them together?

A. *Sutures.*

Q. How many KINDS OF SUTURES are there?

A. Three: they are said to be *true*, when the edges of the bones are serrated and indented into each other; to be *false*, when the edge of the one bone overlaps that of the other; and *harmonic*, or *harmoniæ*, when the edges of the bones are simply applied to each other.

Q. What *sutures* are *true?*

A. The coronal, sagittal, and lambdoidal.

Q. What *sutures* are called *false?*

A. The temporal or squamous.

Q. What *sutures* are *harmonic?*

A. The harmonic sutures connect the bones of the face.

Q. What is the *situation* of the *coronal suture?*

A. It runs across between the frontal and parietal bones.

Q. How is the *sagittal suture* placed?

A. It is placed longitudinally on the summit, and connects the parietal bones to each other.

Q. How is the *lambdoidal suture* situated?

A. It commences at the posterior part of the parietal bones, stretches obliquely downwards on each side of the occipital bone, and connects it to the parietal.

Q. What is meant by the *additamenta* of the *lambdoidal suture?*

A. That part of the lambdoidal suture between the oc-

cipital and temporal bones, is called *additamenta sutūrae lambdoidālis.*

Q. Describe tho *temporal* or *squamous sutures?*

A. The squamous suture is semicircular, and connects the temporal bone on either side above to the parietal. The upper curved edge of the temporal slides above, and overlaps the edge of the parietal bone.

Q. What are the *additamenta* of the *squamous suture?*

A. Those parts of the squamous sutures between the under and back portions of the parietal, and the upper and back of the temporal bones, become serrated, and are sometimes termed *additamenta sutūrae squamōsae.*

Q. What *other sutures* are there besides those already mentioned?

A. The *ethmoidal, sphenoidal, transverse, zygomatic,* and *harmonic* sutures.

Q. What *advantages* are derived from the Sutures of the cranium?

A. Ossification in the foetus is more speedily completed in different bones, than if the cranium had been formed of one: the bones being at some distance from each other at birth, can be made to approach and overlap each other, to yield by their elasticity, and thus to accommodate the head of the child to the passage: the sutures also afford a firmer adhesion to the dura mater, and a free communication between the external and internal vessels, especially in young persons; and they frequently prevent a fracture from extending farther than the suture, with which it comes in contact.

OF THE FRONTAL BONE.

Q. Describe the situation of the frontal bone?

A. The *os frontis* forms the anterior part of the cranium, and the upper part of the face.

Q. Into how many *portions* is it divided?

A. Into a frontal and facial portion.

Q. What is its general form?

A. Its shape somewhat resembles a shell; its upper part is concave internally, and convex and smooth externally.

Q. What are the *processes* of the frontal bone?

A. At the inner side of the orbits are the two *internal angular*, between which is the *nasal* process: at the outer side of the orbits are the two *external angular;* between the internal and external angular processes, on either side, the two *superciliary ridges* extend, from which the two *orbitar processes* or *plates* run back, forming the upper part of the orbit; and two *roundish eminences* are frequently observed above the internal ends of the superciliary ridges, and behind the external angular processes are the *temporal processes* or *ridge.*

Q. What parts are attached to the *internal angular* process?

A. The *corrugātor supercilii,* and more internally the *cartilaginous pulley* of the *obliquus superior* muscle of the eye.

Q. What is attached to the *temporal ridge?*

A. A part of the *temporal muscle,* and of the *aponeurotic expansion* which covers it.

Q. What is contained under the *eminences* above the superciliary ridges?

A. They are immediately over the cavities, called *frontal sinuses.*

Q. How can frontal sinuses be formed in the solid bone?

A. The bones of the cranium are composed of an *external* and an *internal* hard *plate,* called *tables;* and when they are separated, the sinuses are formed between them.

Q. What connects these two tables?

A. *Cancelli,* or *diploë* of various thickness.

Q. What is the appearance of the *frontal bone internally?*

A. Its concave surface is furrowed and sinuated.

Q. What produces those *furrows* and *sinuosities?*

A. Branches of the *arteries* of the dura mater are

situated in the furrows; and the *convolutions* of tho anterior lobes of the brain lie in tho sinuosities.

Q. What *processes* appear internally?

A. Tho *spine* in the middle of the under part of the bone extending upwards from the convex projections of the orbitar processes on either side.

Q. What parts are attached to the *frontal spine?*

A. The end of the *falx major.*

Q. What rests on the *projecting orbitar processes?*

A. The two anterior lobes of the brain.

Q. Describe the *depressions* of the frontal bone?

A. Behind the temporal end of the superciliary ridges, there is a *sinuosity* in the orbitar depressions; behind each internal angular process a *small pit;* the *temporal fossa; a fissure* between the orbitar processes; and the *frontal furrow* internally extending upwards from the spine.

Q. What is contained in the *temporal sinuosity?*

A. The *lachrymal gland.*

Q. What is attached to the *small pit* under each internal angular process?

A. The *cartilaginous pulley* of the superior oblique or trochlearis muscle.

Q. What occupies the *temporal fossa?*

A. Part of the *temporal muscle.*

Q. What is placed in the *fissure* between the orbitar processes?

A. The *cribriform plate* of the ethmoid bone.

Q. What occupies the *frontal furrow?*

A. The upper part of the *superior longitudinal sinus* of the dura mater.

Q. How many *foramina* are found in the frontal bone?

A. Three on each side. The *foramen supra-orbitarium,* near the inner end of each superciliary ridge; the *foramen orbitarium internum anterius,* et *posterius,* between the orbitar plates of the frontal and ethmoidal bones, about half an inch distant from one another in each orbit; and internally the *foramen coecum* in the middle, at the under part of the spine.

Q. What passes through the *foramen supra-orbitarium?*

A. The *frontal artery* and *nerve.*

Q. Whence does this *artery* arise?

A. The *frontal artery* is said to be a branch of the ophthalmic, but it is in reality a continuation of the trunk of the ophthalmic.

Q. Whence comes the *frontal nerve?*

A. It is a branch, or rather a continuation of the trunk, of the ophthalmic nerve, sent off from the fifth pair.

Q. What passes through the two *foramina orbitaria interna?*

A. Small *twigs* from the *ophthalmic nerve*, and small branches from the *ocular artery*, pass through them into the nose.

Q. What is transmitted through the *foramen coecum?*

A. *Small blood vessels* pass through it into the substance of the bone, and frequently into the nose: here too the *superior longitudinal sinus* takes its origin.

Q. What is the *state* of the frontal bone *in the foetus?*

A. In the foetus, at full time, it is divided perpendicularly in the middle; at the upper and back part of the two pieces it is incomplete, and forms part of the *bregma* or *fontanella;* the *frontal sinuses*, and the *superciliary foramina*, are not yet formed.

Q. What *purposes* does the frontal bone serve?

A. It defends and supports the two anterior lobes of the brain; it forms a great part of the orbits; and it assists in forming the septum narium.

Q. What are its *connexions?*

A. The coronal suture connects it above to the parietal bones; the sphenoidal below to the sphenoid bone; and the transverse suture anteriorly to the bones of the face.

OF THE PARIETAL BONES.

Q. Describe the situation and form of the *parietal bones?*

A. They are situated on the lateral and superior parts of the cranium; are somewhat quadrangular; but their upper and fore sides are longer than those behind and below; their inferior side is a concave arch; their inferior and anterior angle is so acute that it resembles a process.

Q. What is the external appearance of the parietal bone?

A. It is smooth and convex, and exhibits a transverse semicircular ridge.

Q. What is attached to that *ridge?*

A. Part of the origin of the *temporal muscle.*

Q. Has the parietal bone any *foramina?*

A. It has generally one, named *foramen parietale,* near its upper and back part.

Q. What vessels pass through it?

A. A *vein* from the integuments passes into the superior longitudinal sinus; and sometimes also a small branch of the temporal or occipital *artery* is sent through it to the falx and dura mater.

Q. Are there any *depressions* on its internal surface?

A. Yes; it is indented with furrows, which begin by a trunk at the inferior and anterior angle, and divide into many ramifications; there is a depression or groove along its upper edge; a fossa near its posterior and inferior angle; and several other irregular depressions in various parts of it.

Q. What forms the *furrows* proceeding from the inferior and anterior angle of the parietal bone?

A. The trunk and branches of the *meningeal artery,* which is sent off from the internal maxillary.

Q. What is contained in the *groove* under the sagittal suture?

A. When the parietal bones are placed together, the

longitudinal sinus occupies the groove formed in the bones.

Q. What is contained in the *fossa* near its inferior and posterior angle?

A. A part of the *lateral sinus.*

Q. What occupies the *numerous irregular depressions?*

A. The different convolutions and prominences of the brain.

Q. Have the parietal bones two *tables* and a *diploë* between them?

A. Yes; their tables and diploë are very complete and distinct.

Q. What is the *state* of the parietal bones *in the foetus* at full time?

A. Their sides are incomplete; they have no *foramen parietale;* and betwcen them and the divided middle of the os frontis is an unossified space, filled by a strong ligamentous membrane, called the *bregma* or *fontanella.*

Q. Describe the *connexions* of the parietal bones?

A. They are connected above to each other by the sagittal suture; before to the frontal bone by the coronal suture; below to the temporal bone by the squamous suture; to the sphenoid bone by the sphenoidal suture; and behind to the occipital bone by the lambdoidal suture.

Q. What *purposes* do the parietal bones serve?

A. They form the superior and lateral parts of the cranium, support and protect the lateral lobes of the brain.

OF THE OCCIPITAL BONE.

Q. Where is the *occipital bone* situated?

A. In the posterior and inferior part of the cranium.

Q. What is its *figure?*

A. It is somewhat *rhomboidal,* with its upper angle rounded, its two lateral ones obtuse, its inferior one flattened, and projecting forwards into the form of a wedge.

Q. What *elevations* does the external surface of the occipital bone exhibit?

A. It has a superior and an inferior transverse ridge; a perpendicular spine crossing these; unequal edges of the foramen magnum; the two condyles situated one on each side of the great foramen, deepest at their internal parts, and running obliquely forwards and inwards.

Q. What forms the *superior transverse ridge?*

A. The two *muscles* named *trapezii;* and the origin of the *occipito-frontalis* are fixed to that spine.

Q. What produces the *inferior transverse ridge?*

A. The *recti postīci,* and *oblīqui superiōres.*

Q. What forms the *perpendicular spine?*

A. The muscles of the opposite sides leave a prominent ridge between them, which crosses the transverse in their middle, and forms the *crucial spine.*

Q. What are the *external depressions* of the occipital bone?

A. A considerable one between the middle of the superior and inferior transverse ridges; one laterally between the ridges and temporal bones; others between the inferior ridge and foramen magnum; a rough surface round the condyles; another rough surface between them and the mastoid processes of the temporal bones; and a semilunar notch on each side.

Q. What occupies the depression between the transverse ridges?

A. The insertion of the two *complexi muscles* towards the perpendicular spine; and of the *splenii* more laterally.

Q. What is situated in the depression between the inferior ridge and foramen magnum?

A. The insertion of the *recti minōres postīci.*

Q. What is situated more laterally on the rough surface towards the mastoid processes?

A. The insertion of the two *recti majōres postīci.*

Q. What does the *semilunar notch* tend to form?

A. This notch forms part of the *forāmen lacĕrum posterius,* which is completed by the petrous portion of the temporal bone.

Q. Describe the position of the *two condyles?*

A. When the base of the cranium is turned uppermost, the condyles appear with their anterior ends converging, following the curve of the foramen magnum, terminate nearly in a line with its anterior part; while their posterior ends diverge a little as they follow the margin of the foramen magnum, and terminate a few lines behind its middle or transverse diameter.

Q. What is the *form of the condyles?*

A. Their surface is circular from the anterior to the posterior end, and oblique, in consequence of their inner sides next the foramen magnum being higher or deeper, and their lateral sides depressed in an inclined plane.

Q. What is the use of that *oblique surface* laterally?

A. To form a firm articulation with the *Atlas*, or first vertebra of the neck; and to prevent the head from sliding to either side.

Q. What *motions* does the head perform on its condyles?

A. The figure and position of the condyles admit of motions forwards and backwards only.

Q. What performs the *rotatory motions* of the head?

A. The rotatory movement of the *atlas*, or first vertebra, upon the second, or *vertebra dentāta*, of the neck.

Q. By what are the motions of the head, when inclined from right to left, performed?

A. By means of the five lower cervical vertebrae.

Q. Describe the *elevations on the internal surface* of the occipital bone?

A. It exhibits a horizontal ridge, and a perpendicular ridge or spine, crossing the former in the middle at right angles.

Q. What *depressions* and *grooves* does its internal surface exhibit?

A. Four large depressions formed by the cruciform spine, which is grooved on its apex; a curved fossa on either side of the foramen magnum; the concavity of the cuneiform process; and a curved fossa on either side of it.

Q. What parts are situated in these great depressions?

A. Those two above the horizontal spine contain the two *posterior lobes* of the brain; and the two below that ridge, on either side of the perpendicular spine, contain the two *hemispheres of the cerebellum.*

Q. What parts are attached to the *cruciform spine?*

A. The posterior part of the *falx major* is attached to the portion of the perpendicular spine above the horizontal ridge; and the posterior and inferior part of the *falx minor* to that below it. The *tentorium cerebelli* is attached to the horizontal ridge.

Q. What forms the *grooves* or *furrows* on the top of those spines?

A. The posterior part of the *superior longitudinal sinus* is situated in the groove of the perpendicular spine above the horizontal; and the *occipital sinus* in that below it. The *lateral sinuses* occupy the groove on the horizontal ridge.

Q. How are these *sinuses formed?*

A. By a duplicature of the *dura mater* in contact with the spines.

Q. What is lodged in the *curved fossae* at either side of the foramen magnum?

A. The lower ends of the *lateral sinuses* just before their exit from the cranium.

Q. Do the *lateral sinuses* go out of the cranium?

A. No; their name is changed as soon as they penetrate the *foramĭna lacĕra posteriōra*, into that of the *internal jugular veins.*

Q. What is situated on the *concavity of the cuneiform process?*

A. The *medulla oblongāta.*

Q. What parts occupy the *curved fossa* on either side of that concavity of the cuneiform process?

A. The *inferior petrosal sinuses.*

Q. How many *foramina* do we find in the occipital bone?

A. Five; namely, the foramen magnum, the two anterior, and two posterior condyloid foramina.

Q What parts pass through the *foramen magnum?*

A. The *medulla oblongata*, the *vertebral blood-vessels*, and the two *accessory nerves*.

Q. What pass through the two *anterior condyloid foramina?*

A. The *lingual*, or ninth pair of *nerves*.

Q. What do the two *posterior condyloid foramina* transmit?

A. *Veins*, either from the occiput or vertebral veins to be emptied into the lateral sinuses.

Q. What are the *connexions* of the occipital bone?

A. It is joined above to the two parietal bones by the lambdoidal suture; to the temporal bones laterally by the additamenta sutūrae lambdoidālis; to the sphenoid bone below by ossification similar to that of epiphysis; and to the atlas, or first vertebra of the neck, by a double articulation with its condyles, named *ginglimus*.

Q. What *purposes* does the occipital bone serve?

A. It forms the posterior, and a good portion of the inferior part of the cranium; it supports and defends the two posterior lobes of the brain, the whole of the cerebellum, medulla oblongata, and part of the longitudinal, of the lateral; and the whole of the occipital, sinuses.

Q. What is the *state* of this bone *in the infant* at full time?

A. It is composed of four pieces connected by cartilage; the first piece forms all the bone above the foramen magnum, other two are placed at the sides of the foramen, and compose nearly the whole of the condyles, and the fourth piece makes the cuneiform process.

OF THE TEMPORAL BONES.

Q. Where is the temporal bone situated?

A. In the lower part of the side, and in the base of the cranium.

Q. Into how many portions is it divided?

A. Into three, a squamous, a petrous, and a mammillary portion.

Q. Why are such names given to thoso portions?

A. The upper portion of the bone is thin and smooth, and, with its semi-circular margin, overlaps the temporal bone, as a scale, hence its name *squamous:* that portion of it in the base of the cranium is very hard, hence the appellation *petrous;* and its external depending portion somewhat resembles the mamma, hence it is named *mastoid or mammillary.*

Q. How many *processes* has the temporal bone?

A. Three very conspicuous, viz. the mastoid or mammillary, the zygomatic, and the styloid; and two less so, namely, the vaginal and auditory.

Q. Is the *mammillary process* solid?

A. No; it contains small cells, which communicate with each other, and also with the *tympănum* of the car.

Q. What parts are attached to it?

A. The *sterno-mastoidēus* muscle is inserted into its anterior and lower part; and to its posterior rough surface the *trachēlo-mastoidēus*, and part of the *splenius* are inserted.

Q. What *use* can the communication of the mastoid cells with the tympanum of the car serve?

A. It is supposed that sounds, being reverberated and multiplied in those cells, are increased before they are applied to the internal ear, which is the immediate organ of hearing.

Q. What is the *situation* of the *zygomatic process?*

A. It arises at the under part of the squamous portion, forming an arch; it projects forwards to join with the *os malae.*

Q. What parts lie under the *zygōma?*

A. The *temporal muscle.*

Q. What parts are attached to the *zygōma?*

A. The strong *aponeurōsis* of the temporal muscle is attached to its upper edge; and, from its under edge, a part of the *massēter* muscle arises.

Q. What is the situation of the *styloid process?*

A. It projects downwards from the under part of the petrous portion, with its base forming a curved ridge on

the margin of the glenoid cavity, towards the root of the zygoma.

Q. What parts are attached to the *styloid process?*

A. It gives origin to three muscles, namely, the *stylo-glossus*, *stylo-hyoidēus*, and *stylo-pharyngēus;* and sometimes to a ligament of the *os hyoides*, and to another of the inferior maxilla.

Q. Where are the *vaginal* and *auditory processes* situated?

A. Around the base of the styloid process anteriorly, the *pars petrosa* rises into a rough curved ridge, named the *vaginal* process: the *rough semi-circular ridge* extending from the base of the mastoid to that of the zygomatic, is called the *auditory* process.

Q. What *is attached* to the *vaginal* and *auditory processes?*

A. No particular part is attached to the vaginal; the *cartilage*, to which the membrāna tympāni is attached, adheres to the margin of the auditory process.

Q. Enumerate the *sinuosities* or *depressions* on the external surface of the temporal bone?

A. A groove or fossa at the inner and posterior part of the base of the mastoid process; the glenoid cavity surrounded by the bases of the zygoma, auditory, and vaginal processes; the glenoid fissure running across the cavity from the base of the styloid process of the sphenoid bone to the anterior part of the meatus auditorius externus; a depression between this fissure and the base of the styloid process; the thimble-like cavity, or jugular fossa, at the inner side of the styloid process.

Q. What occupies the *groove* or *fossa* near the mastoid process?

A. The *digastric muscle* arises from it.

Q. What occupies the *glenoid cavity?*

A. The anterior part of it is lined with cartilage, and is filled with the *condyle* of the inferior maxilla to form a firm articulation.

Q. What is situated in the *glenoid fissure?*

A. Part of the *capsular ligament* of the articulation is

attached to it; the *laxātor tympăni* muscle, and the nerve, named *chorda tympăni*, pass through it.

Q. What is lodged in the *depression* between that fissure and the styloid process?

A. Part of the *parotid gland*, and a cellular fatty substance.

Q. What occupies the *thimble-like cavity?*

A. The commencement of the *internal jugular vein*, which is bulged back and upwards into it, and forms what is termed the *jugular divertictulum.*

Q. What things are observable on the *internal surface* of the temporal bone?

A. It is very unequal, and exhibits various grooves; the petrous portion of large size projects inwards and forwards with a sharp ridge above, and with two flattened sides.

Q. What forms the *inequalities* and *grooves* on its inside?

A. The *convolutions* of the middle lobes of the brain lie in the depressions; and the *arteries* of the dura mater are situated in the grooves.

Q. What is contained in the *petrous portion?*

A. The three *semicircular canals*, the *cochlea*, and *vestible*, which constitute the labyrinth.

Q. What is attached to the *ridge* of the petrous portion?

A. Part of the *tentorium cerebelli.*

Q. What parts are applied to its two flattish sides?

A. The lateral lobe of the brain is opposed to its anterior and exterior side; and the anterior part of the cerebellum to its posterior and inner side.

Q. Enumerate the *fossae* or *depressions* of the internal surface of the temporal bone?

A. They are two; a *groove* upon the ridge of the petrous portion; and a *tortuous fossa* at the root of its posterior side.

Q. What vessels are situated in these?

A. The *superior petrosal sinus* is situated in the groove of the ridge; and the *lateral sinus*, in the winding fossa.

Q. How many *foramina* are in the external surface of the temporal bone?

A. Five; the meatus auditorius externus; foramen stylo-mastoideum between the styloid and mastoid processes; foramen carotĭcum at the inner and fore part of the jugular fossa; the osseous origin of the Eustachian tube between the glenoid fissure and the internal carotid artery; and the foramen mastoideum at the posterior part of the mastoid process.

Q. What *purposes* does the *meatus auditorius externus* serve?

A. It admits the undulating motions of the air to the *membrāna tympăni*, which vibrates and communicates the impulses to the organs of the internal ear, that the sensation of sound may be excited.

Q. What is transmitted by the *foramen stylo-mastoideum?*

A. The *portio dura* of the seventh pair of nerves.

Q. What does the *foramen caroticum* transmit?

A. The *internal carotid artery* enters the cranium; and the *great sympathetic nerve* passes out by it.

Q. What is the structure of the *Eustachian tube?*

A. The osseous portion of this tube is inconsiderable and irregular; it is partly cartilaginous and partly ligamentous, and widens towards the posterior part of the nostrils.

Q. What is the *use* of the *Eustachian tube?*

A. It forms a communication between the external air, and the air in the tympănum of the ear, that the membrana tympani may vibrate easily and freely.

Q. Is *this tube* the *medium* by which pain is communicated to the ear in some cases of inflammatory sore throat?

A. Yes; in sore throat the pain extends along it into the ear.

Q. What is the cause of both the voice and hearing being affected in *Catarrh?*

A. The sound of the voice is diminished by the *stuffing up* of the *foramina* entering into the *sinuses;* and the hearing is impaired by the *stuffing* of the *Eusta-*

chian tube, in consequence of a slight inflammation of the internal membrane of the nostrils.

Q. What passes through the *foramen mastoideum?*

A. This foramen is sometimes awanting, sometimes in the course of the lambdoidal suture, though commonly behind the mastoid process; it transmits a *vein* from the integuments of the head to the lateral sinus; or sometimes a branch of the *occipital artery* to be distributed on the back part of the dura mater.

Q. How many *foramina* are in the internal surface of the temporal bone?

A. Three, and one common to it and the occipital bone.

Q. Describe these foramina?

A. The *meatus auditorius internus* in the posterior side of the petrous portion, being large and proceeding outwardly, soon divides into several small holes, one of which, on the superior and anterior part of the meatus, larger and more conspicuous than the others, leads into the *aqueduct of Fallopius:* the *foramen innominatum* or *Vidianum* in the middle of the anterior side of petrous portion; the *orifice* of the *carotic canal* at the anterior part of the apex of the petrous portion; and the *forāmen lacĕrum posterius,* common to the temporal and occipital bones, is found at the middle and inferior part of the posterior side of the petrous portion.

Q. What parts *enter* the *meatus auditorius internus?*

A. The *seventh pair* of nerves, consisting of a *portio dura* and a *portio mollis;* and the *arteria auditoria interna.*

Q. What is the course of the *portio dura?*

A. It enters the *aquae ductus Fallopii* by the superior and anterior conspicuous foramen in the bottom of the meatus auditorius internus, and, after a long passage in the bone, emerges by the *foramen stylo-mastoideum*, and is distributed upon the face and side of the head.

Q. What principal branches does the *portio dura receive* and *give off* while in the aqueduct?

A. Soon after its entrance into the aqueductus Fallopii, it receives a *small branch, reflected* from the second

branch, or maxillaris superior, of the fifth pair of nerves; the portio dura passes on in the aqueduct about half an inch, and then *sends off* the *chorda tympăni;* in its course it gives off small filaments to the mastoid cells, and stapedius muscle.

Q. What is the destination of the *portio mollis?*

A. The portio mollis, much larger than the portio dura, divides into two *fasciculi* of nearly equal size, one of which is distributed to the *cochlea;* and the other to the *vestible* and *semi-circular canals.*

Q. What occupies the *foramen innominatum*, or, as it is sometimes called, *Vidianum?*

A. This foramen gives entrance to the *retrograde nerve*, from the second branch of the fifth pair, which joins the *portio dura* in the aqueduct of Fallopius.

Q. What does the *orifice* of the *carotic canal* transmit?

A. The *internal carotid artery.*

Q. Is the *carotic canal* a straight passage, or what?

A. No; it is very tortuous: near the *foramen caroticum* it first runs directly upwards, then obliquely forwards, and then again forms a turn equal to a right angle, and runs horizontally for fully half an inch in the anterior part of the petrous portion; and, lastly, at its orifice, the canal makes another turn at nearly a right angle upwards and obliquely forwards.

Q. What seems to be the *cause* of the carotic canal being *so tortuous?*

A. Those turnings and windings seem destined to diminish the force, or impetus, of the blood in the carotid artery before it enters the brain, lest it should injure its soft tender substance, and derange the functions of that important organ.

Q. What passes through the *foramen lacerum posterius?*

A. The lateral sinus of the brain, the *par vagum*, or eighth pair of nerves; the *glosso-pharyngeus* or lingualis lateralis nerve; and the *nervus accessorius* ad par octavum.

Q. Does the *lateral sinus* pass through this foramen?

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A. It enters into it, and terminates; and the *internal jugular vein* begins within the *foramen lacerum posterius*.

Q. In what part of the foramen do the three nerves pass out?

A. In its anterior part; and they are frequently separated from the sinus behind, by a process of the dura mater, which is sometimes ossified.

Q. What small bones are contained in the tympănum of the temporal bone?

A. Four, commonly called *ossicula audĭtus*, the malleus, incus, os orbiculare, and stapes.

Q. Describe the malleus?

A. It has a round head, small neck, and manubrium or handle, and two small processes.

Q. Describe the incus?

A. It has a body and two crura of unequal length.

Q. Describe the os orbiculare?

A. It is of a round form, and is the smallest bone of the body.

Q. Describe the stapes?

A. It has a head, two crura of unequal length, and an oval base.

Q. How are these ossicula situated and connected with each other?

A. The handle of the malleus adheres to the membrana tympani, and its head rests on the body of the incus, to which it is articulated, and the short crus of the incus is extended backwards and bound by a ligament, its long one is turned downwards, and with its flattened point is joined to the os orbiculare, which also adheres to the head of the stapes, which itself is placed horizontally, and nearly at a right angle with the inferior crus of the incus; and the base of the stapes is articulated with the fenestra ovalis.

Q. Have they any muscles attached to them?

A. Yes; the *tensor tympani*, inserted into the handle of the malleus, tightens the membrana tympani: the *laxator tympani*, inserted into the long process of the malleus, draws it forwards and outwards, and relaxes that

membrane; and the *stapedius* inserted into the posterior part of the head of the stapes, draws it obliquely upwards and backwards, by which movement the membrana tympani is stretched and made tense.

Q. Mention the *connexions* of the temporal bone?

A. Its superior semi-circular edge is connected to the parietal bone by the squamous suture; its posterior part to the same bone by the additamentum suturae squamosae, and to the occipital bone by the additamentum suturae lambdoidalis; its inferior anterior part to the sphenoid bone by the sphenoidal suture, and the zygoma to the os malae by the zygomatic suture.

Q. What are the *uses* of the temporal bone?

A. It supports and defends the middle lobes of the brain; affords attachment to part of the tentorium; a passage to important arteries and nerves; contains the chief organs of hearing; gives an articulating cavity to the lower jaw, and origin to various muscles already mentioned.

Q. What is the *state* of the temporal bone *in the foetus* at full time?

A. In the foetal temporal bone, the squamous portion is attached by a cartilaginous fissure to the petrous; there is no mastoid, or styloid process; there is an osseous ring instead of an external meatus.

OF THE SPHENOID BONE.

Q. In what part of the cranium is the sphenoid bone situated?

A. Transversely in the middle of its base.

Q. How is it divided?

A. Generally into a *body*, two *alae*, and two *pterygoid portions*.

Q. What is its *figure?*

A. It is very irregular; and has been compared to a *bat* with its wings extended.

Q. What *processes* do we see in, or connected with, each ala or wing?

A. Four; the *temporal*, *orbitar*, *spinous*, and *styloid* processes.

Q. Describe tho *situation* of these processes?

A. At the lateral or temporal extremity of the bone, is a broad hollowed process or plate, which is named the *temporal;* at the fore part of the temporal plate is the *orbitar plate* slightly concave; the lowest and back part of the wing, where it juts out sharp to meet the petrous portion of the temporal bone, is named the *spinous process;* from near the point of which the *styloid process* arises.

Q. What *external processes* arise from its body?

A. Three; the *two pterygoid*, and the *azygos* process.

Q. Describe the *situation* of these processes?

A. The two *pterygoid processes* are situated at the under and lateral part of the body, each is composed of an external and an internal plate, at the lower end of this is a *hook-like process;* the *azygos process* hangs between the pterygoid from the middle and fore part of the body.

Q. What *depressions* are in the external part of the sphenoid bone?

A. An arch between the temporal and spinous processes; between the base of the external pterygoid plate, and that of the temporal one, is a large depression; and between the pterygoid plates is the *fossa pterygoidea;* and farther back a smaller one at the root of the internal plate.

Q. What is situated in the hollow of the temporal plates?

A. A part of the *temporal muscles.*

Q. What does the *orbitar plate* form?

A. A portion of the exterior and posterior side of the orbit.

Q. What is *attached* to the *spinous* and *styloid* process?

A. The origin of the *circumflexus palāti* muscle.

Q. What occupies the arch?

A. It receives the *fore part* of the temporal bone.

Q. What is situated in the depression between the external pterygoid and temporal processes?

A. The origin of the *external pterygoid* muscle.

Q. What occupies the *fossa pterygoidea?*

A. The origin of the *internal pterygoid* muscle.

Q. What occupies the smaller depression at the root of the internal plate?

A. Part of the origin of the *circumflexus palāti* muscle.

Q. What is the use of the *hook-like process* of the internal pterygoid plate?

A. The *tendon* of the *circumflexus palati* plays round it as on a pulley.

Q. What is the *use* of the *internal pterygoid plate?*

A. To form the back part of the side of the nostril.

Q. What is the use of the *processus azygos?*

A. To form the back and upper part of the septum narium, to which the vomer is joined.

Q. What *processes* or *elevations* does the upper or inside of the sphenoid bone present?

A. From the anterior part of its body *two clinoid processes* arise, which project laterally, and terminate in the spinous process on either side; from the posterior part of its body a *posterior clinoid process* arises, frequently ending in two knobs; from between the anterior clinoid a *pointed process* juts forward, called the *ethmoidal;* and a *processus olivāris* rises a little behind them.

Q. Has the space within the clinoid processes any particular name?

A. Yes; it is called *Sella Turcica.*

Q. What gland is situated in the sella turcica?

A. The *pituitary gland,* which was anciently supposed to secrete the mucus of the nose.

Q. What purposes do these processes serve?

A. They seem to be destined to give a connecting medium to other bones, to support the lobes of the brain, and to give a direction to its vessels. The *ethmoidal* process gives attachment to the *vomer.*

Q. Describe the *depressions* on the inside of this bone, and their uses.

A. The *temporal fossae* on either side supporting a part of the middle lobes; and a *fossa* between the anterior clinoid processes supporting part of the two anterior lobes of the brain; a *depression* before the processus olivāris in which the junction of the optic nerves lies; and a *fossa* on each side of this process in which these nerves run in their course to the orbits; the *fossa pituitaria* between the processus olivaris and the posterior clinoid process, in which the pituitary gland is situated; and a *curved groove* on each side of the posterior clinoid process, in which the internal carotid arteries have their course.

Q. How many *foramina* has each side of the sphenoid bone?

A. Six; the foramen opticum, f. lacĕrum superius, f. rotundum, f. ovāle, f. spināle, and the f. pterygoidēum.

Q. Describe the situation and use of the *foramen opcum?*

A. The foramen opticum is situated immediately below the anterior clinoid process, and gives a passage to the *optic nerve*, and *opthalmic artery* into the orbit.

Q. What are the situation and use of the *foramen lacĕrum superius?*

A. The foramen lacerum superius, being a large fissure between the transverse spinous and orbitar processes, affords a passage to the *third, fourth, first branch* of the fifth, and *sixth, pairs* of *nerves*, and sometimes to the *arteria lachrymalis*, out into the orbit; and to the *ocular veins*, going inward to the cavernous sinus.

Q. Describe the situation and use of the *foramen rotundum?*

A. The foramen rotundum, situated a little behind the former, gives a passage to the *superior maxillary nerve*, being the second branch of the fifth pair.

Q. Describe the situation and use of the *foramen ovāle?*

A. The foramen ovale, larger, and situated posteriorly, and more externally than the last, gives a passage to the *inferior maxillary nerve*, being the third branch of the fifth pair, and commonly also to the *veins*, which accompany the principal arteries of the dura mater out of the cranium.

Q. What situation and use has the *foramen spināle?*

A. The foramen spinale, situated a little to the exterior and back part of the former in the points of the spinous process, transmits the *arteria meningēa*, the principal artery of the dura mater, and sometimes *a vein*.

Q. Describe the situation and use of the *foramen pterygoidēum?*

A. The foramen pterygoideum or vidianum, situated at the root of the internal pterygoid process, transmits *two small branches of nerves* reflected from the superior maxillary.

Q. What is the *destination* of these two *reflected nerves?*

A. The *one* passes into the *carotic canal*, and joins the *plexus* of the *great sympathetic* there around the carotid artery; and the *other* enters the *foramen innominatum* of the petrous portion of the temporal bone, and joins the *portio dura* of the seventh pair in the aqueduct of Fallopius.

Q. Is the body of the *sphenoid bone* solid?

A. No; at the under and fore part of its body, the two *sphenoidal sinuses* are formed.

Q. Do they communicate?

A. No; there is an osseous septum or plate between them.

Q. Where is the passage into them situated?

A. At the upper and fore part of each sinus, a passage, or round hole, is situated, which leads to the posterior and superior part of the nostril, through the ethmoid cells.

Q. Are the *sphenoidal sinuses* and passage to them lined with a membrane?

A. Yes; with a membrane similar to that of the nostrils.

Q. Describe the *connexions* of the sphenoid bone?

A. Its *alae* are joined to the parietal bones above, to the frontal and two malar before, and to the two temporal behind; its *body* and *spinous processes* to the frontal and ethmoid before, and to the occipital behind; its *pterygoid processes* to the two palate, and two superior maxillary bones; and its *azygos process* is joined to the vomer, and nasal plate of the ethmoid bone.

Q. What is the *state* of the sphenoid bone *in the foetus?*

A. At full time this bone is pretty complete, its alae are connected by cartilage, which maceration destroys, and they separate from the body: it has no sinuses.

OF THE ETHMOID BONE.

Q. In what part of the cranium is this ethmoid, or cribriform, bone situated?

A. In the anterior and middle part of its base.

Q. What is its general figure?

A. Cubical.

Q. How is it generally divided?

A. Into the cribriform plate with its process, the nasal plate, the cells, and the two superior spongy bones.

Q. Describe the situation of the *cribriform plate* and its process?

A. It contains many foramina, and is situated horizontally in the base of the cranium, and from its upper or inner side the *crista galli* arises highest anteriorly.

Q. What is the situation of the *nasal plate,* and *ethmoid cells?*

A. The nasal plate extends downwards and forwards

from the middle of the cribriform plate; and the *cells* are formed on either side of it by thin laminae of bone, the exterior of which forms the *orbitar plate*, or *os planum*.

Q. Where are the *ossa spongiosa superiōra* situated?

A. One on either side projecting downwards and inwards from the cells.

Q. What passes through the *foramina* of the *cribriform plate?*

A. The *olfactory* or first pair of *nerves*.

Q. What is attached to the *crista galli?*

A. The anterior end of the *falx major*.

Q. What is the *use* of the *nasal plate?*

A. To form the *septum narium*.

Q. What is the *use* of the *ethmoid cells?*

A. Their use is considered the same as that of the frontal and sphenoidal sinuses, namely, to strengthen the voice by resounding the notes, and to increase the sense of smell by amplifying the surface, on which the olfactory nerves are distributed.

Q. What are their communications?

A. The *ethmoid cells* communicate with each other, with the frontal sinuses, and with the nostrils.

Q. Are *these cells* frequently the *seat of diseases?*

A. Yes; of Venereal Ulcers.

Q. What is the *use* of the *ossa spongiosa superiora?*

A. They afford a large surface on which the *olfactory nerves* are dispersed, and thus tend to augment the sense of smell.

Q. Are the *spongy bones* also the *seat of disease?*

A. Yes; *Polypi* often grow up on their surface.

Q. What covers all those ethmoid cells, and turbinated or spongy bones in the recent subject?

A. *A continuation of the mucous membrane* which lines the nostrils.

Q. Describe the *connexions* of the ethmoid bone?

A. The *cribriform plates* are connected with the orbitar plates of the frontal bone by the ethmoidal suture; with the sphenoid bone by the sphenoidal suture; *the orbitar plates*, or *ossa plana*, with the orbitar plates of

the frontal bone by the transverse suture; *the posterior edge* of the nasal plate with the azygos process of the sphenoid bone; its *superior edge* with the nasal processes of the frontal and nasal bones; and its *anterior edge* with the middle cartilage of the nose.

Q. What is the *condition* of the ethmoid bone *in the foetus?*

A. It is divided into two portions by a cartilaginous partition, which, becoming afterwards ossified, forms the nasal plate and crista galli.

Remarks.

Q. Is the *diploë* interposed between the external and internal tables, or plates, of all parts of the bones?

A. No; at the frontal and sphenoidal sinuses there is no diploë; in various other parts of the occipital, and squamous portions of the temporal bones, the two tables are so closely compressed, and so thin, as to be somewhat diaphonous in advanced age, and to contain no evident diploë.

Q. Does this inequality of thickness in the bones of the cranium render the *Operation of Trephining* more hazardous?

A. Yes; opposite to the posterior lobes of the brain in the occipital, and to the middle lobes in the squamous portion of the temporal bones, their substance is much thinner, which the surgeon ought to keep in mind while operating in these parts.

Q. On what parts of the parietal bone is the *application of the trephine dangerous?*

A. The *meningeal artery* lies often deep in a groove at the interior and inferior angle of the parietal bone, and is in danger of being divided by the trephine applied near that corner; the other parts of this bone admit of its application.

Q. On what other parts of the cranium is the *application of the trephine dangerous?*

A. It cannot be applied with safety on the *course* of the *superior longitudinal* or *lateral sinuses.*

Q. What cases require the operation of the trephine?

A. A *depressed portion* of bone, or a *collection of pus*, or *extravasated blood*, in consequence of an injury.

Q. How is a *fracture* of the bone distinguished from a *suture?*

A. The situation of the sutures is well known: and a fracture, though near one or more sutures, is accompanied with a roughness in its edges, which the surgeon can discover by a probe, or his finger.

Q. Are there not some *small bones* sometimes in the course of the lambdoidal suture, and how could they be distinguished from broken pieces of bone?

A. *Ossa triquetra*, or *Wormiana*, as they are called, are often situated in the lambdoidal suture, but in that case the sutures feel smooth, while the edges of a fracture are rough, and often ragged to the touch.

Q. Is the *application of the trephine* necessary in every case of fracture, or when?

A. No; not in every case; in those only where there is a portion of bone evidently depressed, and in consequence of which symptoms of compression of the brain supervene.

Q. What are the *symptoms of a compressed brain?*

A. Vomiting, drowsiness, or insensibility, dilated pupil, slow pulse; stertcrous breathing, and involuntary discharge of urine and faeces.

Q. Does a *depressed portion* of the cranium then always require the operation?

A. No; a depression may be attended with no bad symptoms, such as those just mentioned, and then any operation is quite unnecessary.

Q. May not the injury applied to the cranium be sufficient to *rupture some arteries* of the dura mater, and perhaps to produce a long fracture without depression of bone?

A. Yes; and in that case the symptoms already enumerated, which indicate compression of the brain, appear and increase in aggravation.

Q. Is the *application of the trephine* necessary in every case where *pus* or *extravasation* has taken place?

A. Yes; if the symptoms become urgent we have no alternative.

Q. How could the *precise part* where the pus is collected, or where the rupture of the vessels has happened be ascertained?

A. It is difficult, and often impossible to ascertain the situation of the matter collected, or the fluid effused; because it may be collected in a part of the brain far from the ruptured vessel, or the seat of the injury received.

Q. What *rule* must direct the surgeon in such cases, where the urgency of symptoms demands his interference?

A. He must apply the trephine a *little below* that part where marks of external violence are most evident; or if no violence be apparent, at a *depending part* on the side seemingly affected.

Q. In a case of a fractured and depressed portion of bone, which requires an operation, is the *trephine* to be applied *to the fractured and depressed part* only, or where?

A. Yes; if the depressed portion is firm enough to bear the force necessary for the rotation of the trephine; if not, the trephine should be placed partly on the solid bone, capable of bearing the force, and partly on the fractured portion.

Q. What *object* has the surgeon in view by this *operation?*

A. To make an opening in the cranium sufficient to introduce an instrument *to elevate* the depressed portion of bone.

Q. Would *Mr Hey's saw*, in a number of cases, not answer this purpose better than the trephine?

A. Yes; and in such cases the saw should be preferred.

Q. If the *extravasated fluid*, after removing a portion of bone with the trephine or saw, be found under the dura mater, what is to be done?

A. It has been evacuated by *puncturing the dura mater*, but it is a dangerous practice, and nothing can justify the perforating of the dura mater, but the urgent and fatal aspect of the symptoms.

OF THE BONES OF THE FACE.

Q. How are the bones of the face divided?

A. Into those of the upper and lower maxilla.

Q. What bones are contained in the *superior maxilla?*

A. It contains six *pairs* of bones and the *vomer*, besides the teeth.

Q. What bones does the *inferior maxilla* consist of?

A. Of one, together with the teeth.

OF THE OSSA NASI.

Q. Where is the *os nasi* situated?

A. In the upper part of the nose.

Q. What is its *figure?*

A. Oblong, rather thin, bent backwards, convex externally with its fellow forming an arch, and broadest at its inferior extremity.

Q. Has the os nasi any *processes?*

A. One, the *spinous* process.

Q. Has it any *foramina?*

A. One or two generally.

Q. What do they transmit?

A. *Bloodvessels* to the substance of the bone, or into the internal membrane of the nostrils.

Q. What are the *connexions* of the nasal bone?

A. Its thick ragged upper end is joined to the frontal bone by the transverse suture; its thick anterior edge to its fellow by the nasal suture; its lower end to the cartilaginous part of the nose, and its spinous process to the nasal lamella of the ethmoid bone?

Q. Is it complete *in the foetus?*

A. It is proportionally shorter and thinner, but pretty complete.

Q. What is the *use* of the ossa nasi taken together?

A. They cover and defend the root of the nose.

OF THE OSSA UNGUIS, OR LACHRYMALIA.

Q. What is the *situation* of the *os lachrymale?*

A. At the inner and interior part of the orbit, and covering the ethmoid cells.

Q. What is its *figure?*

A. Irregular and thin, having two depressions externally, and a ridge between them; and internally or posteriorly having a groove between two convexities.

Q. What do the external *depressions* form?

A. The posterior forms part of the orbit; the anterior depression, being a deep groove or fossa larger above, lodges part of the *lachrymal sac* and *duct.*

Q. What is the use of the middle ridge?

A. It forms the proper boundary of the orbit.

Q. What do the groove and convexities internally form?

A. They correspond to the ethmoid cells, to which they are contiguous.

Q. What are the *connexions* of the os lachrymale?

A. It is connected above to the frontal, behind to the os planum of the ethmoid bone by the transverse suture; before and below to the maxillary bone by the lachrymal suture.

Q. What are the *uses* of this bone?

A. It composes part of the orbit, lodges a part of the lachrymal sac and duct, and covers part of the ethmoid cells.

Q. Is the os lachrymale complete in the *foetus?*

A. Yes, fully formed.

Q. Is the os lachrymale ever subject to a *surgical operation?*

A. Yes; in the *Fistula Lachrymalis*, when the nasal duct, which conveys the tears from the eye to the back part of the nostrils, is obstructed, a perforation is made in this bone, and an artificial duct formed.

OF THE OSSA MALARUM.

Q. What is the situation of the *os malae?*

A. In the outer part of the cheek, forming the prominence.

Q. What is its *figure?*

A. Somewhat square, with four acute angles.

Q. What appearance has its external and internal surface?

A. It is convex and smooth externally, and posteriorly or internally hollow.

Q. What *processes* has it?

A. Five; the *superior orbitar*, forming part of the outside of the orbit; the *inferior orbitary*, forming its lower edge; the *maxillary*, having a broad and rough surface, by which it is joined to the superior maxilla; the *zygomatic*, joining the temporal bone; and the *internal orbitar plate*, forming the outer and fore part of the orbit.

Q. What *muscles* are attached to its external surface?

A. The *massēter* arises from the space between the maxillary and zygomatic processes below; the *zygomaticus major*, and *minor*, from that near the zygomatic process; part of the origin of the *massēter*, and of the insertion of the *temporal aponeurōsis*, are attached to the under edge of the *zygoma*.

Q. What is lodged in its posterior hollow behind the zygomatic process?

A. Part of the *temporal muscle*.

Q. Describe the *connexions* of the malar bone?

A. It is joined by its superior and internal orbitary processes to the frontal and sphenoid bones; by the edge of its internal and inferior orbitar processes, and inner side to the os maxillare; and by its zygomatic process to the zygoma of the temporal bone.

Q. Is the *os malae* perfect *in the foetus* at full time?

A. Yes; it is fully ossified.

OF THE OSSA MAXILLARIA SUPERIORA.

Q. Where is the superior maxillary bone situated?

A. In the anterior part of the upper jaw, and side of the nose.

Q. What is its *figure* and size?

A. Its figure is irregular, and its size the largest of the bones of the face.

Q. How many *elevations* or *processes* has it?

A. Seven; the *nasal*, making part of the side of the nose; the *orbitar*, forming part of the orbit; the *malar*, joining the os malae, and forming part of the prominence of the cheek; the *bulbous* behind, forming the back boundary of the antrum; the *alveolar*, in which the teeth are fixed; the *palatine*, forming part of the roof of the mouth; and the *spinous process*, rising to form part of the septum narium.

Q. What *muscle* arises from the bulbous process?

A. A part of the *pterygoidēus externus*.

Q. What is attached to the *orbitar process*?

A. A portion of the *orbicularis oculi*, but chiefly from its nasal process; and the *obliquus inferior*, arise from it.

Q. How many *depressions* are in the os maxillare superius?

A. Seven; one behind the malar process; a second at the under and fore part of the malar process; a third in the under arch of the palate; a fourth the semicircular notch above the palatine plate; a fifth the alveolar arch; a sixth the lachrymal fossa in the nasal process; and a seventh, the canal in the orbitar plate.

Q. What occupies the *temporal depression* behind the malar process?

A. The under part of the *temporal muscle* plays in it.

Q. What occupies the *second depression* between the malar and alveolar processes?

A. The origin of the *levator angŭli oris*, and part of the *levator labii superioris alaeque nasi;* and a *branch* of the fifth pair *of nerves* embedded in fat.

Q. What occupies the third, or *palatine depression ?*

A. It forms a part of, and enlarges the cavity of the mouth.

Q. What occupies the fourth, or *nasal depression ?*

A. The cavity of the nostril.

Q. Where is the *alveolar process*, or arch, situated ?

A. Along the inferior margin of the maxilla.

Q. What is the *structure* of the alveoli ?

A. The bone is soft and spongy, having holes, or depressions, corresponding in size to the fangs, or roots, of the teeth.

Q. Why is it porous and spongy ?

A. To give a firmer insertion to the teeth, and adhesion to the membrane reflected from the gums, and a passage to blood-vessels into the substance of the bone.

Q. What occupies the *lachrymal fossa ?*

A. This fossa, together with that of the os lachrymale, or unguis, forms a *canal*, which is occupied by the *lachrymal duct ?*

Q. What does the *canal in the orbitar plate* contain ?

A. The *superior maxillary nerve*, and a *branch* of the *internal maxillary artery.*

Q. How many *foramina* has the os maxillare superius ?

A. Five ; three proper to it, namely the foramen infra-orbitarium, foramen incisīvum, and the opening into the antrum maxillare ; and two common to it with other bones, viz. the spheno-maxillary fissure and the palatine foramen.

Q. Describe the *situation* and *use* of the *foramen infra-orbitarium ?*

A. The foramen infra-orbitarium situated just below the orbit, is the opening of the canal in the orbitar plate, and transmits the *superior maxillary nerve*, being the second branch of the fifth pair ; and *infra-orbitar artery*, being a branch of the internal maxillary, to be distributed upon the face.

Q. Describe the *situation* and *use* of the *foramen*

incisīvum, or *palatīnum anterius*, as it is sometimes called?

A. It is situated in the mesial line behind the inner *incisores*, common to both the palate bones below, but separates above into two holes, each of which opens into its respective nostril, just at the side of the septum narium: it forms *a communication* for small blood-vessels and nerves passing between the membranes of the mouth and nose.

Q. Describe the *situation* of the *antrum maxillare*, or *Highmorianum*, and its orifice.

A. It occupies the whole inner part of the bone under the orbitar plate, and above the dentes molares, and before the tuberosity; its *orifice* is large in the separate bone; but in the connected state of the bones, it is about the size of a crow's quill, and is situated between the os spongiosum superius and inferius in the nostril.

Q. Is this *antrum lined* with a membrane?

A. Yes; with the same membrane as that of the nostrils, but a little thinner.

Q. Describe the *situation* and *use* of the *spheno-maxillary fissure?*

A. This fissure, composed partly by this bone, and partly by the malar and sphenoid, situated in the outer and under part of the orbit, transmits small branches of *arteries*, *veins*, and nerves, to the adjacent parts; lodges fat for lubricating the globe of the eye, and part of the temporal muscle.

Q. Describe the *situation* and *use* of the *foramen palatīnum?*

A. It is situated at the inner side of the back part of the tuberosity; and is formed by a fossa in the superior maxillary, and a corresponding one in the os palati; it transmits a *branch* of the *superior maxillary nerve*, and of an *artery* to be distributed in the substance of the bone, and to the palate.

Q. Describe the *connexions* of the superior maxillary bone?

A. It is connected above to the frontal bone by the

transverse suture; to the os unguis by the lachrymal suture; to the os nasi by the lateral nasal suture; to the os malae by the internal and external orbitar sutures; to the os planum by the ethmoidal suture; to its fellow below by the longitudinal palatine suture; and to its fellow between the nose and mouth by the mystachial suture.

Q. What is the *state* of the os maxillare superius *in the foetus* at full time?

A. It has no tuberosity, scarcely any maxillary sinus, and only six alveolar processes.

Q. What is the *use* of the *maxillary sinuses?*

A. They serve to give strength and tone to the voice.

Q. Is ever any *surgical operation* necessary upon these sinuses?

A. Yes; they are subject to inflammation and suppuration; and when the openings into the nostrils are obstructed, the pus or matter collected must be evacuated by a surgical operation.

Q. How is that *operation* to be performed?

A. It may be done various ways; but to extract one of the dentes molares immediately under the sinus, in which the fluid is contained, and to make a perforation in the sinus with a trocar, is the best method; for by this the fluid can be thoroughly evacuated.

OF THE OSSA PALATI.

Q. What is the *situation* of the *palate bone?*

A. In the posterior part of the arch of the palate, between the pterygoid processes and the superior maxillary bones.

Q. What is its *figure?*

A. It is very irregular, though generally considered a kind of oblong square.

Q. Into how many *portions* is it commonly divided?

A. Into four; namely, its palatine, pterygoid, nasal, and orbitary portions, which are named processes

Q. Describe the *palatine portion?*

A. This seems the base or body of the bone, is concave above and below, and completes the arch of the palate and the bottom of the nostrils; its inner edge is raised into a *spinous process*, which with its fellow of the opposite side forms a *groove;* its posterior edge is *pointed* internally, where it joins its fellow; its anterior edge is unequal and ragged, and firmly joined to the palatine process of the maxillary bone.

Q. Describe the *pterygoid portion?*

A. This is the lower and posterior part of the bone, of a triangular shape, with its base below, and becoming smaller as it ascends: its posterior part has *three fossae*, the two lateral receive the ends of the two *pterygoid plates* of the sphenoid bone; the middle fossa makes part of the *fossa pterygoidea;* its anterior aspect is irregularly concave, receiving the back part of the tuberosity of the os maxillare.

Q. Describe its *nasal portion?*

A. It is very thin and brittle, is situated on the side of the nose; its internal surface is a little concave; it rises up from the external and upper edge of the palatine portion and from the narrow extremity of the pterygoid process, forms a considerable part of the side of the maxillary sinus, and closes the space between the sphenoid and maxillary bones; across the middle of its inner surface there is a *ridge* corresponding to that of the maxillary bone.

Q. Describe the *orbitar portion* of the os palati?

A. It rises from the upper and back part of the nasal plate, and is divided from it by a *notch*, which forms part of the foramen spheno-palatinum; it forms a small part of the bottom of the orbit behind the os planum and maxillary; it has its anterior and lateral part contiguous to the maxillary sinus, and more posteriorly it covers the ethmoid cells; it also closes the sphenoidal sinus, except at its upper and fore part a hole is left.

Q. What is attached to the *posterior arch* of the palate bone?

A. The *velum pendŭlum pālati.*

Q. What is attached to the *posterior point* formed by the junction of the two palate bones?

A. The muscle named *azygos uvŭlae*.

Q. What is lodged in the *groove* formed by the spinous processes?

A. The under edge of the *vomer*.

Q. What purpose does the *transverse ridge* on the inner surface of the nasal plate serve?

A. The back part of the inferior spongy bone rests upon it.

Q. What are the *connexions* of the *os palati?*

A. Its *palatine plate* is connected to the os maxillare by the transverse palatine suture; its *nasal* and *orbitar processes*, to the same bone by the palato-maxillary suture; its *pterygoid* and back part of the *nasal process*, to the sphenoid bone by the sphenoidal suture; its *transverse ridge* of the nasal plate, to the *os spongiosum inferius*.

Q. What *purposes* does the os palati serve?

A. It forms part of the palate, of the nostril, of the orbit, of the fossa pterygoidea, of the side of the maxillary, ethmoidal, and sphenoidal sinuses.

Q. What is the *state* of this bone *in the foetus?*

A. It is very complete; its nasal plate is thicker than in the adult; no cells are attached to its orbitar process.

Q. Why are the *eyes* often affected in cases of *ulcerated palate?*

A. The palate, by means of the os palati and its vessels and nerves, has a direct communication with the orbit, and thus affects the eyes through sympathy.

OF THE OSSA SPONGIOSA INFERIORA.

Q. What is the situation of the *os spongiosum inferius?*

A. In the lateral and under part of the nostril, adhering to the transverse ridge of the maxillary and palate bones.

Q. Describe its *processes?*

A. The inferior spongy bone lies horizontally with its convex surface towards the septum; from its upper edge *two processes* arise, the *anterior* ascending forms part of the *lachrymal groove;* and the *posterior*, descending in the form of a hook, makes part of the side of the *maxillary sinus.*

Q. What *purposes* do the *spongy* or *turbinated bones* serve in the nostrils?

A. They afford a large surface, on which the mucous membrane is expanded, in whose substance the olfactory nerves are dispersed, and the organ of smell greatly strengthened; they also cover a part of the antra maxillaria, and assist in forming the under part of the *lachrymal ducts.*

Q. What is their *state in the foetus?*

A. They are almost complete.

OF THE VOMER.

Q. Where is the *vomer* situated?

A. In the lower and back part of the septum narium.

Q. What is its *figure?*

A. It is compared to a plough-share.

Q. Describe the *vomer?*

A. Its sides are flat and smooth, its superior and posterior edge appears oblique at the back of the nostrils; is thick and grooved to receive the azygos process of the sphenoid bone, and the *nasal plate* of the ethmoid; its inferior edge is received into the *groove* formed by the *spinous process* of the palate and maxillary bones; its posterior part unconnected with any other bone is over the fauces; and its anterior edge is *furrowed* for receiving the *middle cartilage* of the nose.

Q. What are the *connexions* of the vomer?

A. It is connected above to the sphenoid and ethmoid bones, and to the middle cartilage of the nose; below, to the maxillary and palate bones.

Q. What are the *uses* of the vomer?

A. It divides the nostrils, supports the other bones of

the nose, and enlarges the internal surface for increasing the organ of smell.

OF THE INFERIOR MAXILLA.

Q. Where is the inferior maxilla situated?

A. In the lower part of the face.

Q. How is it commonly divided?

A. Into seven parts, the *chin*, between the two anterior foramina; the *sides*, between these and the angles; the two *angles*; and the two *rami* arising from them.

Q. What *processes* has the inferior maxilla?

A. Five; the two *condyloid*, two *coronoid*, and the *alveolar* processes.

Q. Are there not others?

A. Yes, of less consideration: such as, a protuberance externally, and another internally, extending from the base of the coronoid process on either side to the chin; the transverse ridge in the middle of the chin, called *symphysis menti*, and some small eminences on either side of it, both on the out and inside of the bone.

Q. Describe the situation and use of the *condyloid processes*?

A. They are placed at the two extremities of the rami; they have an oblong *head*, situated obliquely transverse, supported by a *cervix*; they are covered with cartilage, and adapted to the *glenoid cavity* of the temporal bone, with which they form an articulation.

Q. Describe the situation and use of the *coronoid processes*?

A. They project upwards, about an inch anterior to the condyloid; are thin, and give attachment to strong muscles.

Q. Describe the situation and use of the *alveolar processes*?

A. They extend along the upper edge of the bone, from the base of the one coronoid process to that of the other; are broadest behind, and serve to give insertion to the teeth.

Q. What purposes do the other eminences serve?

A. They give insertion and origin to various muscles.

Q. What secures the head of the condyle in the glenoid cavity?

A. A strong *capsular ligament*, attached to the cervix, and to the margin of the cavity; and also the different muscles.

Q. What *muscles* are attached to the anterior part of the *condyloid process?*

A. The *pterygoidēus externus* is inserted into the fore part of the condyloid process, from the base of the coronoid upwards, and partly into the capsular ligament.

Q. What *muscles* are attached to the *coronoid process?*

A. The *tendon* of the *temporal muscle* is inserted around it.

Q. What *muscles* are attached to the external and internal parts of the *angles?*

A. The *massēter* is inserted into the external, and the *pterygoidēus internus* into the internal side of the angles.

Q. What *muscles* are attached to the *longitudinal ridges* from the base of the coronoid process to the chin?

A. The *buccinātor* partly arises from the outer, and the *mylo-hyoidēus* from the inner ridge, together with the membrane of the gums.

Q. What *muscles* are attached to the *chin?*

A. On either side of the symphysis externally, the *levator*, and *depressor labii inferioris*, the *depressor anguli oris*, and the *digastrĭcus*, arise; internally near the symphysis the *fraenum linguae*, the *genio-hyoidēus*, and the *genio-hyo-glossus*.

Q. How many *foramina* are in the inferior maxilla?

A. Four; two in the external aspect, called *foramina menti;* and the two *foramina maxillaria posteriora;* one on each side, on the internal aspect, in the centre between the angle and the extremities of the condyloid and coronoid processes.

Q. What purpose does the *posterior maxillary foramen* on either side serve?

A. It receives the trunk of the *inferior maxillary nerve*, which is the third branch of the fifth pair; and the *inferior maxillary artery*, which is a branch of the internal maxillary, and its *vein*.

Q. What purposes do the *foramina menti* serve?

A. The *nerve* and *artery* just mentioned, as entering the posterior maxillary foramen, run forwards in the *maxillary canal*, and ultimately emerge from it by the *foramen menti*, on either side, to be distributed on the chin.

Q. What happens while the artery and nerve are passing along that canal?

A. They give off *branches* to the *teeth*, and substance of the bone.

Q. Are there any *grooves* observable in the inferior maxilla?

A. Yes; a *large one* between the condyloid process and the foramen maxillare posterius; and a *less one* from this foramen directed forwards.

Q. What forms and occupies these *grooves*?

A. The *trunks* of the *artery* and *nerve* entering the canal form the *larger*; and the *lingual branch* sent off from the *inferior maxillary nerve*, just where it enters the canal, forms the *smaller groove*, in its course forwards to the tongue.

Q. What is the *state* of the inferior maxilla *in the foetus*?

A. It is composed of two pieces, joined in the middle by cartilage, which becomes ossified in after life, and forms the *symphysis menti*.

OF THE TEETH.

Q. How many teeth are inserted into each jaw in the adult?

A. Sixteen.

Q. How are the teeth classed?

A. Into *incisŏres*, *canīni* or *cuspidati*, and *molares* which include the *bicuspĭdes*.

Q. How many of each class are in each jaw?

A. Four *incisores* in front; on either side of these, a *caninus* or *cuspidatus*, two *bicuspides*, and three *molares*.

Q. What is the division of each tooth?

A. Into a body or *corōna* above the gum, a *cervix* at the socket, and *fangs* or *roots* fixed in the bone.

Q. What substances compose the teeth?

A. One very hard, on the cortical or external surface of the corōna or body, called *enamel;* another softer and similar to common bone towards the centre of the corona, and in the cervix and roots.

Q. Has each tooth any *foramen?*

A. Yes; in the point of its roots a *hole* receives its *nerves* and *blood-vessels.*

Q. Are the *fangs* surrounded by a membrane?

A. Yes; a *vascular membrane*, reflected from the gums, covers the roots of the teeth, lines their sockets, and answers the purposes of a periosteum.

Q. Has each class a certain number of roots?

A. Yes; the *incisōres* and *canīni* have a single root, and also the two *bicuspides* of the lower jaw; while those of the upper have generally two, and the *large molares* three or four roots.

Q. What is the *state* of the teeth *in the foetus* at full time?

A. There are in each piece of the inferior maxilla, and in each side of the superior, two incisores, one cuspidatus, and two molares, in the form of shells within the jaw, or under the gums.

Q. Does any membrane surround the foetal teeth?

A. Yes; each tooth is included in a *capsule*, which is connected with the gums.

Q. When do the teeth appear above the gums?

A. About the sixth or seventh month after birth.

Q. How long is it before all the ten teeth in each jaw are cut?

A. They are generally all through the gums within the first two years of age.

Q. When do these *temporary*, or *deciduous teeth* loosen and come out?

A. About the seventh or eighth year of age.

Q. What is the cause of their coming out?

A. The *second* or *permanent teeth* lying concealed in the maxillae, increase in size and firmness, shoot up on the roots of the deciduous, which, by their irritation, are absorbed, and the bodies of the teeth, of course, fall out; while the permanent ones grow up, and occupy their place.

Q. What seems to be the *course of a second set* of teeth being provided?

A. The temporary ones are adapted to the size of the maxillary bones in the infantile state; and when the jaws shoot out and grow larger, these teeth become too small; *another larger set* is therefore provided, suited to the increased size of the jaws, and destined to be permanent.

OF THE OS HYOIDES.

Q. Where is the *os hyoides* situated?

A. Horizontally, between the root of the tongue and the larynx.

Q. What is its *figure?*

A. It has been compared to the Greek letter upsilon υ.

Q. How is the os hyoides divided?

A. Into a *body* and *two cornua.*

Q. Describe the *body* of it?

A. It is convex before, concave behind, and pretty broad in the middle.

Q. Describe its *cornua?*

A. They extend backwards and upwards from either side of its body, with their two plain surfaces slanting downwards and onwards; *each cornu* becoming smaller, ends in a *round tubercle.*

Q. Where are its *appendices* situated?

A. An appendix projects upwards from the articulation of the cornu with the body on each side.

Q. To what parts are the cornua attached?

A. Their *round tubercles* are connected with, and, as

it were, rest upon the upper cornu of the *thyroid cartilage*.

Q. What are the *connexions* of its appendices?

A. From each appendix a *ligament* ascends to the *styloid process* of the temporal bone.

Q. Are these attachments sufficient to keep the bone in its situation?

A. Yes; assisted by the various muscles attached to it.

Q. What *muscles* are attached to the *body* of the os hyoides?

A. The *sterno-hyoideus*, part of the *thyro-hyoideus, omo-hyoideus, genio-hyoideus*, part of the *genio-hyoglossus*, are inserted into it on either side.

Q. What *muscles* are attached to its *cornua*?

A. The origin of the *hyo-glossus*, and the insertion of the *stylo-hyoideus*, on each side.

Q. Is the *os hyoides* attached to other parts?

A. It is attached to the root of the tongue, epiglottis, and thyroid cartilage, by ligaments and membranes.

Q. What is the *use* of the os hyoides?

A. It serves as a lever for the muscles acting upon the tongue, larynx, and fauces.

Q. What is its *state in the foetus*?

A. It is mostly all in a cartilaginous state.

BONES OF THE TRUNK.

Q. How are the bones of the trunk generally divided?

A. Into those of the *spine*, those of the *thorax*, and those of the *pelvis*.

OF THE SPINE.

Q. Of what bones is the spine composed?

A. Of *vertĕbrae*, denominated *true* and *false*.

Q. What vertĕbrae are *true*?

A. The cervical, dorsal, and lumbar, in all twenty-four.

Q. What vertebrae are *false*?

A. Those of the *os sacrum*, and *os coccygis.*

Q. In what does the distinction of true and false vertebrae consist?

A. The vertebrae are said to be *true*, when they move upon each other; to be *false*, when they adhere to each other, and do not move.

Q. How many parts does a true vertebra consist of?

A. A *body*, and *seven processes.*

Q. Describe the *body?*

A. It is of a spongy texture, has a horizontal upper and under surface a little hollowed; is convex anteriorly, forming a ring of a firmer and harder structure than the internal substance of the bone; a little concave posteriorly, to form a large, somewhat triangular hole, with the two projections, on which the processes are constructed.

Q. Why are the upper and under surfaces hollowed?

A. To receive the *inter-vertebral substance*, which is of a cartilago-ligamentous nature, and allows the vertebrae to move, as upon ball and socket.

Q. What occupies the *large hole* at the back of the bodies of the vertebrae?

A. The *spinal marrow*, its vessels, and involŭcra.

Q. Are the bodies of the vertebrae of the same size?

A. In the adult the bodies of the lumbar vertebrae are by far the largest, and they diminish in size as they ascend; the dorsal are less, and the cervical vertebrae have scarcely any body.

Q. Why do the vertebrae increase in size as they descend?

A. The vertebral column sustains the weight of the superior parts of the body; and as the weight of the head is only to be sustained by the *cervical vertebrae*, their body is inconsiderable; as the dorsal bear the weight of the head, neck, and superior extremities, their bodies are much larger; and as the lumbar bear the weight of all the upper parts, their bodies are the largest and strongest of all.

Q. Do the sizes of the processes follow the same rule?

A. Yes; the processes become more distinct, and more strongly marked as they descend.

Q. Describe the *situation* of the *seven processes?*

A. Each vertebra, except the first and second, has two articulating or oblique processes above, and two below, placed upon the sides of the arch; two transverse processes, the one projecting to the right, and the other to the left from the sides of the arch between the oblique processes; and a spinous process projecting backwards.

OF THE CERVICAL VERTEBRAE.

Q. What are the marks of a cervical vertebra?

A. Their body is small, solid, and flattened before, to make way for the oesophăgus, and also a little behind; the superior surface a little concave by the lateral portions rising, and the inferior proportionally convex from side to side, and concave a little from before to behind; their transverse processes are perforated.

Q. How are their *articulating surfaces* placed?

A. Very obliquely; the two upper face obliquely backwards and upwards; while the two inferior face obliquely forwards and downwards.

Q. Describe their *transverse process?*

A. They are very short; each is *perforated* perpendicularly, and from the whole to the extremity is grooved on the upper side; has a bifurcated termination.

Q. Describe the *spinous process* of the cervical vertebrae?

A. It is placed horizontally backwards, is short, and forked at the extremity.

Q. Why are the *surfaces* of the cervical vertebrae *hollowed* both laterally and from before backward?

A. To admit of free motion; they can move on each other, as on ball and socket, for their inter-vertebral cartilages are thick and strong.

Q. Why are their transverse processes *perforated?*

A. These perforations form a canal for the passage of the *vertebral artery* and *vein*.

Q. What purposes does the *groove* on the upper part of the transverse processes serve?

A. It receives and protects the *cervical nerves*, which pass out from the spinal marrow.

Q. In what things does the first vertebra, named the ATLAS, differ from the rest?

A. Instead of a body, the *atlas* has an anterior arch with two thick lateral portions, on the upper and under surfaces of which the articulating processes are placed; in the anterior part of its convexity a roundish protuberance, with a cavity on each side, appears: instead of a spinous process, an osseous semicircle is described.

Q. How are the *articulating processes* of the *atlas* placed?

A. The *superior* are oval and hollow, and more horizontal than the rest; they rise considerably on their external margin, and are thus firmly articulated with the *condyles* of the occipital bone: the *inferior* are concave and round, slanting from within outwards and downwards, forming a secure socket for the convex surface of the inferior vertebra.

Q. Has the *atlas* any *perforations*?

A. Yes; it has a *hole*, which easily admits a common writing quill, in each transverse process, which is very long.

Q. Has it any *fossae* or *notches*?

A. Yes; under the outer and back projecting part of the superior oblique processes there is a curved *groove* or *fossa* on either side: there is another more shallow at the posterior part of the inferior oblique processes.

Q. What *vessels* are transmitted by the hole in the transverse processes, and lodged in the groove?

A. The *vertebral artery* passing up, and a *vein* arising from the spinal marrow, its membrane, and deep-seated parts of the neck, descending on either side, occupy the *foramen*, and also the *groove*; but this groove contains also the *tenth pair of nerves* in its passage out from the spinal marrow.

Q. What does the *notch* between the inferior oblique and the transverse process transmit?

A. This notch, together with another similar one in the second vertebra, forms a *hole* through which it transmits the *first pair of cervical nerves* on either side.

Q. Are the *transverse processes* of the *atlas* longer than those of the other cervical vertebrae, and for what purpose?

A. Yes; they are longer, in order to give the muscles attached to them greater power in performing the rotatory motions of the head, by their acting with a longer lever.

Q. What *motions of the head* are performed upon the *atlas?*

A. The condyles of the occipital bone are so obliquely articulated with the atlas, that *motions* of the head *forwards* and *backwards* can only be performed.

Q. What motions of the head are performed between the atlas and second cervical vertebra?

A. The inferior articular processes of the atlas being concave, receive the convex articular surfaces of the second vertebra, and perform *rotatory* and other *motions* of the head in every direction.

Q. Are not some rough protuberances and depressions observable on the fore part of the atlas?

A. Yes; on the posterior part of the anterior arch on each side of the *circular notch,* formed by the *processus dentātus* of the second vertebra, a small rough sinuosity is observable, where ligaments are attached for securing that process in its place; still more laterally is a small rough protuberance and depression, for the insertion of the *transverse ligament.*

Q. What *muscles* are attached to the anterior part of the *atlas?*

A. The *musculi longi colli* are inserted into the tubercle on the convexity of the anterior arch; and the *recti interni minōres* arise from the small cavities on either side of it.

Q. What are attached to the convex part of the posterior arch of the atlas?

A. On the upper and back part of the middle of this arch are two depressions, from which the *recti postĭci minōres* arise; on its lower part are two other sinuosities, in which *ligaments* are fixed for connecting this with the inferior vertebra.

Q. What is the *course* of the *vertebral arteries* before they enter the cranium?

A. These arteries ascend in the canal formed by the holes in the transverse processes of the cervical vertebrae, almost in a straight line, until they reach the third; when they form *various windings* in passing the third, second, and first vertebrae, and then turn suddenly and run horizontally round the condyloid articulations into the *foramen magnum*.

Q. Why do they form *such windings?*

A. That the *impetus of the blood* in them may be diminished, before it enters the tender substance of the brain.

Q. What parts are peculiar to the second, or *vertebra dentata?*

A. It has a perpendicular *tooth-like process* arising from its body; its superior articulating processes almost horizontal, circular, and slightly convex, adapted to perform rotatory motion; its transverse processes very slightly grooved, and not forked.

Q. What is observable on the *dentoid process?*

A. Its fore part is convex and covered with cartilage in the recent subject, where the atlas turns upon it; its back part is also round and smooth, where it moves upon the transverse ligament.

Q. Does the *processus dentatus* exhibit any marks of the attachment of ligaments?

A. Yes; on either side of it the *lateral ligament* arises, and goes obliquely transverse to be inserted into the atlas and occipital bone; and from its apex the *perpendicular ligament* arises, and goes to be inserted into the occipital bone at the margin of the foramen magnum.

Q. Is any thing worthy of observation in the *spinous process* of the *vertebra dentata?*

A. It is short, strong, forked, and turned much downwards, so as not to impede the rotatory motions of the atlas.

Q. Are any *muscles* attached to it?

A. Yes; the *recti capitis postĭci majōres*, and the *obliqui capitis inferiores*, arise from its spinous process.

Q. What is the *state* of the vertebra dentata *at birth?*

A. It consists of four pieces, three of which are common to all the vertebrae, viz. the body and two lateral pieces for the articulating processes; the fourth, the processus dentatus, joined by cartilage to the body, is peculiar to this vertebra.

Q. Is the seventh or last cervical vertebra like the others?

A. It retains some characteristic marks of the cervical, and assumes others of the dorsal vertebrae.

Q. What are these *characteristic marks?*

A. Its transverse processes are *perforated*, and sometimes a cross spiculum of bone divides the vein, which is small, from the vertebral artery. It agrees with the dorsal in having *no bifurcation* at the extremities of its transverse and spinous processes; in having the superior and inferior surfaces of its body less hollow; its articular processes more perpendicular; and its spinous process larger and slanting more downwards.

Q. What is the *form* of the cervical vertebrae when put together?

A. It is pyramidal with the apex towards the head.

Q. What is the figure of the canal, for the reception of the spinal marrow, formed by the holes of the cervical vertebrae?

A. It is semicircular, with the diameter or flat side anterior.

OF THE DORSAL VERTEBRAE.

Q. How many dorsal vertebrae are there?

A. Twelve.

Q. In what do the dorsal vertebrae differ from the cervical?

A. The dorsal want holes in the transverse processes, and have four lateral depressions, two above and two below, at the edges of the superior and inferior surfaces, for the articulation of the ribs.

Q. What are the *peculiarities* of their body?

A. They are flatter at the sides, more hollow behind, and larger; their *articular processes* are *almost perpendicular*, the upper ones slanting forwards, and the under ones backwards; their superior and inferior surfaces are horizontal.

Q. What are their *spinous* processes?

A. They are thick at the roots, and become long and slender as they descend obliquely over each other; are sharp above, and gently hollowed below.

Q. Describe their *transverse* processes?

A. They are long in the upper and middle part of the back, but become shorter near the under part; they project obliquely backwards and downwards, and enlarge at the extremities, which are *hollowed* and *articulated* with the *tubercles* of the ribs.

Q. Have the *first* and *twelfth*, or last, *dorsal vertebrae* any thing peculiar?

A. The *first* is hollowed in its upper surface, and flat in its under one; has an entire pit above, and a half one or notch below on each side, for the heads of the first and second ribs: the *twelfth* has an entire pit below, and a half one above, for the same purpose; it has no articular surface on its transverse processes.

Q. Have the dorsal vertebrae any *lateral notches?*

A. Yes; two on each side, the same as the cervical, between the articular process and body above and below; and when the vertebrae are applied to each other, the notches immediately above and those below form round holes, through which *nerves* pass out from the *spinal marrow*.

Q. What is the form of the *spinal hole* in the dorsal vertebrae?

A. It becomes rounder and narrower as it descends

from the first to the tenth vertebra, and again becomes flatter in the two last.

Q. Do the articular and spinous processes of the dorsal vertebrae admit of much motion?

A. No; the motions are very confined, being chiefly flexion and extension of the trunk.

Q. What is the form of the *inter-vertebral substances?*

A. They are generally thin, but thinnest anteriorly, to enlarge the cavity of the thorax by the curvature of the spine.

OF THE LUMBAR VERTEBRAE.

Q. Describe the bodies of the *five lumbar vertebrae?*

A. They are the largest and broadest of all the vertebrae, increasing as they descend, particularly in breadth; are a little contracted in the middle, and have prominent edges at their concave, superior, and inferior surfaces.

Q. Describe their *transverse processes?*

A. They are flat before and behind, are long, slender, and almost erect, to allow free motion, and to give attachment to large muscles.

Q. Describe their *spinous processes?*

A. They are short, straight, strong, and horizontal, with narrow edges above and below; and broad flat sides, to give origin to strong muscles.

Q. Describe the *articular processes* of the lumbar vertebrae?

A. They are strong and remarkably deep; the two superior are concave from above to below, facing each other, or turned inwards; and the two inferior ones being convex longitudinally, and placed nearer each other, face outwardly; and being received between the superior articular processes of the next vertebra below, form an articulation, as with ball and socket, adapted for free motions in every direction.

Q. What kind of *inter-vertebral cartilage* have they?

A. These cartilages are very thick, particularly on

the anterior aspect, and, in consequence, the spine is made convex before.

Q. Are these *inter-vertebral cartilages* often the *subjects of disease?*

A. Yes; in scrofulous habits they frequently become inflamed, suppurate, and ultimately cause the spine to become twisted. This wasting of the inter-vertebral cartilages sometimes pervades the spongy substance of the vertebrae themselves, particularly in the loins, and produces *Lumbar Abscess;* or, in infants, *Spina Bifida.*

OF THE OS SACRUM.

Q. What is the *situation* and *figure* of the *os sacrum?*

A. It is situated immediately below the lumbar vertebrae, and forms the back part of the pelvis; its figure is that of an inverted pyramid, and concave anteriorly.

Q. What is it composed of?

A. Of *five vertebrae* grown together, hence called *false;* their adhesions, however, are distinctly marked by transverse prominent lines.

Q. Does the bone exhibit any appearance of *transverse processes?*

A. Yes; they are united, and form a large oblong thick process on either side, and are divided by a perpendicular ridge.

Q. Has the os sacrum any *spinous processes?*

A. Yes; they are short, sharp, and almost erect above, and less observable below.

Q. What is the *form of its canal* for the under end of the spinal marrow?

A. Between the bodies and processes of the three uppermost vertebrae it is triangular; becomes smaller as it descends, and below the third false vertebra it is open behind, where in the recent subject the *spinal marrow* is defended by a strong *ligamentous membrane.*

Q. What is the name of the lower end of the spinal marrow?

A. *Cauda equina*, from its fibrous bushy appearance.

Q. How many *holes* are on the internal surface of the os sacrum?

A. Four pairs of large holes, with grooves leading from them.

Q. How many *foramina* are observable on its external, or posterior surface?

A. Four pairs also, not much smaller in the dry bone, but so filled with membrane and cellular substance in the recent subject, as to become small.

Q. What passes through these foramina of the os sacrum?

A. The great *sacral nerves* pass out from the spinal marrow through the anterior; and *small nerves* also pass out to the large muscles; and *minute arteries* pass in through the posterior foramina.

Q. Has the os sacrum any *notches?*

A. Yes; there is a nôtch on either side below, corresponding to similar ones in the os coccygis, to form holes for the passage of the *last spinal nerves.*

Q. How many *articular surfaces* has the os sacrum?

A. Four; two at the base or upper part of the bone, facing backwards, to be articulated with the two inferior of the *last lumbar vertebra;* and a large, uneven, irregural surface on either side, where it is firmly connected with the *ossa innominata.*

Q. What are the *connexions* of the os sacrum?

A. It is connected with the lumbar vertebra above; the innominata on the sides; and with the base of the os coccygis below.

Q. What *purposes* does it serve?

A. The os sacrum, being triangular with its base above and its apex below, forms a base for supporting the vertebral column, defends the large sacral nerves, of great importance; and behind, affords an origin to strong muscles moving the trunk and inferior extremities.

Q. What is the *condition* of the os sacrum *at birth?*

A. It is composed of five distinct vertebrae, with inter-vertebral substances in the foetal state.

OF THE OS COCCYGIS.

Q. What are the *situation* and *form* of the os coccyx?

A. It hangs from the apex of the os sacrum; is broad and flat above, and tapering below, convex behind, and curved forwards.

Q. How *many portions* does it consist of in the young?

A. Of *four* or *five*, which are similar to vertebrae.

Q. Do these vertebrae adhere in the adult?

A. Yes; they grow together, and admit of no motion, except a general elasticity.

Q. Do any *ligaments* strengthen it?

A. It is covered by a *strong ligament*, which gives origin to numerous muscular fibres on the sides of the bone.

Q. What is the *state* of the os coccyx *in the foetus?*

A. At birth it is almost wholly cartilaginous.

Q. What *uses* does the os coccygis serve?

A. It, with the parts connected with it, contracts the inferior opening of the pelvis, assists in supporting the intestinum rectum, the uterus, and the urinary bladder.

Remarks.

Q. How are these classes of vertebrae to be distinguished?

A. The *cervical* have foramina in their transverse, and bifurcations in their spinous processes: the *dorsal* have cavities on their sides for receiving the *heads*, and a smooth depression on the anterior part of the knobbed extremities of the transverse processes, for articulating with the *tubercle* of the ribs; and spinous processes sharply ridged above, hollowed below, and very much sloped downwards: the *lumbar* have no holes in their transverse processes, no depressions for the ribs on their

bodies or transverse processes, and no sloping spines; but they have larger bodies, long horizontal transverse processes, broad horizontal spinous processes with their edge up, and articular processes facing outwards and inwards.

Q. What parts of the vertebral column are best adapted to motion ?

A. The cervical and lumbar vertebrae admit of free motion in every direction; the dorsal admit of motion forwards and backwards chiefly, and but of little laterally.

Q. Why are the dorsal vertebrae so confined in their motions ?

A. That they may more safely defend the vital organs attached to various parts of the thorax.

Q. Are not vital organs contained in the abdomen, and yet why are the lumbar vertebrae destined to have free motion ?

A. The important organs, namely, the *viscera*, are loosely attached to the internal surface of the bodies of the vertebrae, and in consequence are not affected by the free motions of the lumbar vertebrae.

BONES OF THE THORAX.

Q. What is the figure of the thorax ?

A. It is somewhat conical, but largest near the middle; its under part is shorter before than behind, or on the sides.

Q. What bones compose the thorax ?

A. The twelve dorsal vertebrae behind, the sternum before, and the twelve ribs on each side.

OF THE COSTAE, OR RIBS.

Q. How are the ribs commonly divided ?

A. Into *true* and *false*.

Q. How many are in each class ?

A. The *seven superior* are denominated *true*, because they have their cartilages joined to the sternum : the *five inferior* are *false*, because their cartilages do not

reach the sternum, but terminate in that of the last true rib.

Q. Describe the situation and figure of the ribs?

A. They slope a little downwards from their attachment to the vertebrae; are concave and smooth internally, convex externally, are flat near their middle; have an upper roundish edge, and a sharp under one.

Q. What *particular parts* are in *each rib?*

A. A head with a middle ridge, and a plain or hollow surface on each side of it; a cervix; a tubercle; an angle; a fossa or groove on the inner side of the inferior margin; and an oval pit in the anterior extremity.

Q. What parts are connected with the *head?*

A. The head of each rib is adapted to the intervertebral space, having an articulating surface with the vertebra above, and another with that below, excepting the first rib, which is articulated with one vertebra, and has only one articulating surface.

Q. What is the situation and use of the *cervix?*

A. It is between the head and tubercle, and gives attachment to the capsular ligament of the articulation.

Q. Describe the situation and use of the *tubercle?*

A. It is situated a short distance from the head on the posterior part of the rib, having a flat surface, by which it is articulated with the *transverse process* of the lower of the two vertebrae, to which the head is joined.

Q. Where is the *angle* situated, and what is its use?

A. The angle of the rib, situated a little distance from the tubercle, is formed by the expansion of the ribs to give breadth to the thorax, and by the strong *sacro-lumbalis* attached at that place.

Q. What is the use of the *groove* in the under margin?

A. The *intercostal artery*, *vein*, and *nerve*, are lodged in it; but that part of the rib between the head and angle is round, having no artery in contact with it, has no groove: near the anterior extremity too, the groove becomes very inconsiderable and disappears, owing to the smallness of the vessels there.

Q. What is the use of the *oval pit* in the anterior end of the rib?

A. The cartilage, which connects the rib with the sternum, is inserted into that hole.

Q. Are not the ribs somewhat twisted ?

A. Yes ; the rib with its cartilage forms a curve along its superior margin, which rises considerably near the sternum, the curve is greater as the ribs descend.

Q. Have the different ribs the same degree of curve ?

A. No ; the first or upper rib is the most bent, and it is flat above and below, and internally ; in their descent the ribs become gradually straighter.

Q. Are the ribs alike in horizontality ?

A. No ; with respect to the spine, the uppermost rib is nearer horizontal, and the obliquity increases as the ribs descend, their anterior extremities becoming more distant from each other.

Q. Are the *cartilages* of the different ribs of the same length ?

A. No ; the cartilages become longer, but approach nearer as they descend.

Q. Do the ribs differ much in length ?

A. Yes ; the length of the ribs increases from the first to the seventh, and then decreases.

Q. Is the distance between the tubercle and angle of the rib always the same ?

A. No ; the distance increases to the ninth rib, as they descend ; corresponding to the breadth of the thorax, and of the *sacro-lumbalis*, which covers them.

Q. How are the cartilages of the ribs attached ?

A. Those of the true ribs are directly attached to the sternum ; the cartilages of the three upper false ribs are joined to each other, and the union of substance to that of the under true rib.

Q. Are the *cartilages* of the *eleventh* and *twelfth ribs* not joined to the others ?

A. Their cartilages are sometimes joined to the cartilages of the other false ribs ; but the anterior extremities of these ribs more frequently are not joined to the others ; and they lie loose among the muscles, hence are called *floating ribs.*

Q. Has the first rib any cartilage between it and the sternum?

A. Its posterior end is firmly fixed to the first dorsal vertebra, and its anterior to the sternum, so as to admit of no motion; cartilage forms its connecting medium.

Q. Has the second rib any cartilage interposed between it and the sternum?

A. The second rib has a little cartilage, which admits of a small degree of motion, but very little.

Q. Have the first and second ribs any groove in their inferior margin?

A. No; it is somewhat rounded, but is not grooved in these ribs.

Q. Do any of the other ribs want grooves?

A. The eleventh and twelfth generally want both the groove and tubercle.

Physiological Remarks.

Q. What motions are the ribs adapted to perform?

A. Two motions; one upwards and downwards with their anterior extremities, and another somewhat rotatory motion near their middle part.

Q. How can they perform such motions, seeing they are bound at both ends?

A. The articulation of their head with the bodies of the vertebrae, is to be considered the centre of motion; and their anterior extremities, being attached to cartilages, which are elastic and moveable, can be raised or depressed to a certain extent.

Q. How can the attachments of the ribs admit of *rotatory motion?*

A. The first rib is firmly fixed to the vertebra and sternum; hence, when the intercostal muscles act, they pull all the other ribs upwards to it, as a fixed point, in proportion as they are moveable.

Q. Do the ribs acquire mobility as they descend?

A. Yes; in proportion to the length of the cartilages interposed between them and the sternum, and to the

intercostal spaces, which are greatest at the middle of the ribs*.

Q. How is their *rotatory motion performed?*

A. While the intercostal muscles contract and elevate the ribs, they have greater power over their middle, where their fibres are longer and the intercostal spaces wider; hence, when the anterior extremity is checked in its ascent, they elevate the middle of the ribs, and produce a partial rotatory movement on both their extremities.

Q. Do these movements of the ribs enlarge the thorax?

A. Yes; during every inspiration they enlarge the cavity of the thorax in all its dimensions.

Q. What is the *structure* of the substance of the ribs?

A. It is spongy, particularly near their anterior extremities, and covered with a thin external lamella which becomes a little thicker towards their head.

Q. Does this spongy texture render them more susceptible of *disease?*

A. Yes; the anterior extremities of the ribs become soft, and enlarge in size, in *Rickets;* and deformity of the thorax is the consequence.

Q. What is the *state* of the ribs *in the foetus?*

A. The heads and tubercles are pretty well ossified, the other parts are cartilaginous.

Q. What purposes do the ribs serve?

A. They form the sides of the thorax, cover and defend the heart and lungs, and materially assist in the performance of respiration.

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* This was the idea of Haller. Magendie however states just the contrary: that the first rib has the greatest motion; and the reason why it does not appear to be as moveable as the others is because it is shorter—and of course a small degree of motion at the vertebral extremity does not appear as in the other longer ribs; and this he infers from the structure of the ribs, of the vertebrae, and of the ligaments which unite them: he also believes that a joint formed in the sternum, opposite the cartilage of the second rib, contributes, by permitting the motion of the sternum upwards, to the enlargement of the thorax.

OF THE STERNUM.

Q. What are the situation and figure of the sternum?

A. It is situated in the fore and middle part of the thorax, and is of a triangular form, being broad and thick above, and thin and narrow below.

Q. How many pieces is it composed of?

A. Of three, joined together by cartilage, or ossified in the adult.

Q. Describe the sternum?

A. Its external surface is flat; its internal is somewhat hollowed, particularly above; it has thick strong upper corners, with a cavity in each; has seven pits or depressions on each side, which are considerably distant from each other above, but become gradually nearer as they descend.

Q. What is lodged in the cavities on the upper corner on each side?

A. The end of the clavicle on each side is firmly articulated in that cavity with the sternum.

Q. Why is the sternum concave laterally, particularly above?

A. The internal surface of the thorax is round, and the internal part of the sternum forms a portion of its rotundity; the trachēa descending, is lodged under its upper and more concave part.

Q. What do the *pits* on the sides of the sternum receive?

A. They receive the ends of the cartilages of the ribs, which are firmly attached by capsular ligaments.

Q. What is the name of the third or lowest piece of the sternum?

A. It is shaped like the point of a broad-sword, and called *cartilāgo ensiformis*.

Q. What muscles are attached to the sternum?

A. The two *sterno-mastoidēi*, and the two *pectorales majores*.

Q. What is attached to its internal surfacc?

A. The *mediastinum*, and two *sterno-costales* muscles.

Q. What is the *structure* of the sternum?

A. It is cellular, and its cancelli are covered by a thin lamella of a harder texture.

Q. Is it strengthened by any ligament in the recent subject?

A. It is invested by a strong tendinous membrane.

Q. What is the *state* of the sternum *in the foetus?*

A. It is composed of seven or eight pieces, which ultimately unite and form three.

Q. What are the *connexions* of the sternum?

A. It is connected by cartilage to the fourteen upper ribs, and by inter-articular cartilage to the anterior ends of the two clavicles.

Q. What purposes does the *sternum serve?*

A. It gives origin to several muscles, forms part of the thorax, defends the heart and lungs, gives attachment to the mediastinum internally, and to the ribs externally, and is a fulcrum on which the clavicles roll.

BONES OF THE PELVIS.

Q. Where is the *pelvis* situated?

A. At the inferior part of the trunk.

Q. Of what bones is it composed?

A. Of the os sacrum, and os coccygis behind, and of the two ossa innominata laterally and before.

Q. Of how many portions is each *os innominatum* composed?

A. Of three in children, namely, the os ilium, ischium and pubis; which, though completely ossified in the adult, yet retain their names to facilitate the description of this unshapely bone.

OF THE OS ILIUM.

Q. Where is the os ilium situated?

A. In the upper expanded part of the os innominatum.

Q. Describe the *ilium?*

A. Its dorsum or outer surface is irregularly convex, its inner surface concave, its upper edge or spine is thick, rough, and semicircular; its articulating surface with the os sacrum on the under, posterior, and internal part, large and scabrous; from which towards the pubis a transverse ridge called *linea innominata* arises; and on its anterior inferior external side a curved high ridge projects, exhibiting internally a semilunar cavity, behind which is a large notch.

Q. How many *processes* has the os ilium?

A. Four; an anterior superior, and an anterior inferior spinous process; and a superior and an inferior spinous process also behind.

Q. What is attached to the *anterior and superior spinous process?*

A. The *sartorius* muscle, POUPART's *ligament*, and the *tensor vagīnae femŏris.*

Q. What is attached to the *anterior inferior spinous* process?

A. The *rectus femoris* muscle.

Q. What parts are attached to the *posterior superior*, and *inferior spinous* processes?

A. Ligaments for connecting this bone to the os sacrum, and for the origin of muscles.

Q. What *muscles* are attached to the *dorsum of the ilium?*

A. The *three glutēi* muscles arise from it.

Q. What muscles are attached to the crest or spine of the ilium?

A. The *external* or descending *oblique* is inserted into it; and the *internal* or ascending *oblique*, and the *transverse abdominal* muscles, the *gluteus maximus*, *quadratus lumborum*, and *latissimus dorsi*, arise from it.

Q. What *muscle* is attached to its *internal concave* surface?

A. The *iliacus internus.*

Q. Describe the *inferior* and *posterior notch* of the ilium?

A. It is a kind of semi-circle, and when the two sa-

cro-sciatic ligaments are entire in the recent subject, a large hole is formed, named the *sacro-sciatic hole.*

Q. What *vessels* pass through this *foramen sacro-sciaticum?*

A. The *gluteal* and *ischiatic arteries*, the *pyriform* muscle situated between them, and the *sciatic nerve.*

Q. What is the *purpose* of the *linea innominata?*

A. It forms tho lateral portion of the brim of the pelvis, dividing the cavity of the pelvis from that of the abdomen.

Q. What is the *use* of that *semi-lunar cavity* with a highly curved ridge at the inferior anterior and exterior part of the ilium?

A. It forms the upper and back part of the *acetabŭlum*, being the socket in which the head of the femur is articulated.

OF THE OS ISCHIUM.

Q. What are the situation and figure of the os ischium?

A. It is situated at the lowest part of the os innominatum; its figure is irregular.

Q. How is the *os ischium* divided?

A. Into a body, tuberosity, and ramus.

Q. Describe the *os ischium?*

A. The upper part of its body forms the inferior part of the *acetabulum;* behind which its *spinous process* is situated in a line with the notch of the ilium.

Q. What *sinuosities* has the os ischium?

A. Immediately below the spinous process internally is a large depression, sometimes called the cervix; and externally, at the root of the spinous process, and between the acetabulum and tuberosity, is another sinuosity.

Q. Where is the *tūberosity* situated?

A. It is the lowest part of the bone, being that on which the weight of the body rests in the sitting posture.

Q. Where is the *ramus* of the ischium situated?

A. It rises up anteriorly to join the os pubis.

Q. What parts are attached to the *spine* of the ischium?

A. The *superior sacro-sciatic ligament*, the *coccygeus*, *superior gemellus*, and part of the *levator ani*, muscles, arise from it.

Q. What occupies the *sinuosity under* the spinous process?

A. The *tendon* of the *obturātor internus* plays in it.

Q. What occupies the *sinuosity at the root* of the spinous process externally?

A. The *pyriformis* or *iliăcus externus* muscle.

Q. What parts are attached to the upper part of the *tuberosity* of the ischium?

A. The *inferior gemellus*, and *inferior sacro-sciatic ligament*.

Q. What passes through the *foramen* between the superior or internal, the inferior or external sacro-sciatic ligaments, and the great notch or sinuosity of the ilium?

A. The *obturator internus* muscle.

Q. What muscles arise from the upper posterior oblique surfaces of the tuberosity?

A. The *long head of the biceps flexor cruris* and *semitendinosus* arise from the interior; and the *semimembrānōsus* from the exterior surface, which reaches nearer the acetabulum.

Q. What muscle arises from the lower and thinner scabrous part of the tuberosity, bending forwards?

A. The largest head of the *triceps adductor femoris*.

Q. What muscle arises between the external margin of the tuberosity and the great hole of the os innominatum?

A. The *quadratus femoris*.

Q. What parts arise from the scabrous part of the ramus?

A. From its posterior part, the *transversālis* and erector penis; and from its thin scabrous part, the two lower heads of the *triceps adductor femoris;* the *crus penis* in the male, and the *crus clitorĭdes* in the female.

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OF THE OS PUBIS.

Q. What is the situation of the os pubis?

A. At the anterior part of the pelvis.

Q. How is it divided?

A. Into a *body* near the acetabulum; an *angle* at its anterior part, where it joins its fellow of the opposite side; and a *ramus*, which descends from the angle to join the ramus of the os ischium.

Q. Describe the ridges or spines of this bone?

A. A ridge continued round from the linea innominata of the os ilium along its upper and inner edge to the angle, forming part of the brim of the pelvis: another ridge from the former, extending downwards and backwards, in the fore part of the acetabulum.

Q. Where is the *crest* of the pubis?

A. The upper and inner scabrous part, where it joins its fellow.

Q. What parts are attached to it?

A. The *rectus* and *pyramidalis* muscles, and the *end of* POUPART's *ligament*.

Q. What *vessels* pass over the flattened part of the body of the pubis under the ligament of POUPART?

A. The *psoas magnus* and *iliacus internus* muscles play over it, the *femoral artery, vein,* and *nerve,* pass over it nearer to the angle.

Q. What muscle arises from the external part of the angle?

A. The *pectinālis*.

Q. What is the name of the large hole formed by the os ischium and pubis?

A. The *foramen thyroidēum*, which in the recent subject is all filled by a membranous ligament, excepting a *hole* formed by the *obturator ligament*.

Q. What vessels pass through this *foramen obturatorium?*

A. The *obturator artery, vein,* and *nerve.*

Q. What forms the *arch* of the pubis?

A. The two rami of the os pubis form its upper part, and the rami of the os ischium continue it downwards.

Q. What is the name of the junction of the ossa pubis?

A. The *symphysis pubis*, which is strengthened by a ligamentous cartilage, and keeps the two bones so firmly fixed together, as to admit of no motion.

Q. What *occupies the acetabulum?*

A. The round head of the *os femoris.*

Q. What is situated in the *scabrous pit* in the bottom of the acetabulum?

A. The *round ligament* of the head of the femur is attached to it.

Q. What is situated in the breach of the anterior part leading to the insertion of the round ligament?

A. A *ligament* is stretched across from the one side of the breach to the other, and the *synovial apparatus* of the joint is lodged under it, and towards the round ligament; the *vessels* of the joint also enter by it.

Q. Where is the acetabulum deepest?

A. At its upper and back part, its brim there rises very high, and besides is tipped with cartilage in the recent subject.

Q. What parts retain the head of the femur in the acetabulum?

A. The *round ligament* attached to the head of the femur, and inserted into the bottom of the acetabulum, the height and strength of its brim when tipped with cartilage, the capsular ligament, and the muscles surrounding the joint.

Q. What are the *connexions* of the *ossa innominata?*

A. They are connected behind to the os sacrum by a thin cartilage and by strong ligaments, so as to admit of no motion; called *posterior symphysis;* before to each other by a ligamentous cartilage and ligaments so as to prevent all motion, called *symphysis pubis.*

Q. What are the *uses* of the pelvis?

A. It forms a firm arch for supporting the whole weight of the superincumbent parts of the body; it contains the urinary bladder and rectum, and the uterus

also in females; it gives a safe passage to large and important blood vessels and nerves; it gives origin behind to muscles, which extend the trunk; below and before to those which move the thigh; and insertion to others, which bend the body forwards.

Physiological Remarks.

Q. What are the *dimensions* of the brim *of the pelvis?*

A. The *short diameter*, being a line drawn from the middle or promontory of the os sacrum to the crest of the symphysis pubis, is four inches; the *long diameter* in a line drawn from the one os ilium to the other is *five inches and a quarter.* The *diagonal* of these lines, however, is the longest in the recent subject, and the long diameter of the child's head descends in that direction through the brim of the pelvis.

Q. Why is the *diagonal line* the longest in the recent subject?

A. Because the *psoas magnus* and *internal iliac* muscles on each side occupy a considerable space of the internal surface of the ossa ilia; and thereby diminish the long diameter in the skeleton.

Q. What are the *dimensions* of the pelvis *at its outlet* below?

A. The *long diameter* below is the reverse of the brim, being from the symphysis of the arch of the pubis to the point of the os coccygis *five inches and a quarter*, and the *diameter* from the one tuberosity of the ossa ischii to that of the other is *four inches.*

Q. What is the *depth* of the pelvis?

A. From the brim to the point of the os coccygis, down the middle of the os sacrum, the pelvis usually measures *six inches;* on the sides, *three inches and a half;* and before, *one inch and a half.*

Q. Are the dimensions of the pelvis in the female different from those in the male sex?

A. The pelvis is more of an oval figure, and generally larger in the female.

OF THE SUPERIOR EXTREMITIES.

Q. What is the *division* of the bones of the superior extremity?

A. They are divided into the bones of the shoulder, arm, and hand.

Q. How many bones compose *the shoulder?*

A. Two; the *clavicle* and *scapula.*

Q. How many bones compose *the arm?*

A. Three; the *os humeri* in the arm, and the *ulna* and *radius* in the fore-arm.

Q. How are the bones which compose *the hand* subdivided?

A. Into those of the *carpus, metacarpus,* and *fingers.*

Q. How many bones compose the *carpus?*

A. It is composed of *eight bones* disposed in two rows; those of the first are the *scaphoides, lunare, cuneiform, pisiforme;* those of the second row, the *trapezium, trapezoides, os magnum, et unciforme.*

Q. How many bones compose the *metacarpus?*

A. It consists of *four bones* for the fingers, and *one* for the thumb.

Q. How many bones compose the *fingers?*

A. Twelve; arranged into three phalanges.

Q. How many compose the *thumb?*

A. Two.

OF THE CLAVICLE.

Q. What is the *situation* of the clavicle?

A. It is situated transversely between the superior angle of the sternum and the acromion process of the scapula.

Q. What is the *form* of the clavicle?

A. It is long, and a little bent at each end in opposite directions, like the Italic *f*.

Q. What is the appearance of its *sternal extremity?*

A. It is considerably enlarged in size, and triangular,

with its posterior angle produced to form a sharp ridge, its end round, flat, and hollowed, for receiving the inter-articular cartilage adapted to the pit in the sternum.

Q. What is the appearance of the *body* of the clavicle?

A. Its interior portion is bent obliquely forwards and downwards, rounded above, hollowed a little below; its exterior portion somewhat flattened, sloping behind, and bent backwards to form an articulation with the scapula.

Q. Has the clavicle any *tubercle?*

A. Yes; there is a *tubercle* about an inch from the scapular extremity.

Q. What is attached to the *ridge* of the produced posterior angle of its sternal extremity?

A. The *inter-clavicular ligament*, extending from the one clavicle to the other, and binding them firmly together.

Q. What is the nature of the *inter-articular cartilage?*

A. It is very similar to the inter-vertebral cartilages, being very strong and elastic; it grows to the end of the clavicle, and adapted to the hollow of the sternum, and binds them together so as to admit of a considerable degree of rotatory motion.

Q. Has the sternal extremity of the clavicle a *capsular ligament* also?

A. Yes; a strong capsular ligament, which allows the clavicle to move with a rotatory motion.

Q. How is the *scapular extremity* fixed?

A. It is tipped with *cartilage* in the recent subject, which adheres very firmly to the *acromion process* of the scapula.

Q. Has it a *capsular ligament?*

A. Yes; it adheres firmly around the articulation.

Q. What is attached to the *tubercle?*

A. A very strong short *ligament*, which connects the *clavicle* to the *coracoid process* of the scapula.

Q. Does the *articulation* at the scapular extremity admit of much motion?

A. It admits of little or no motion.

Q. What *muscles* are attached to the body of the clavicle near its sternal extremity?

A. The *sterno-hyoidēus*, and *sterno-mastoidēus*, and *pectoral* muscle, partly arise from it.

Q. What *muscle* is situated in the *hollow* below?

A. The *sub-clavian* muscle is inserted there.

Q. What muscles are attached to the body towards the scapular extremity?

A. A portion of the *deltoid* arises from the concave part, and the *trapezius* is inserted into the opposite convex part of it.

Q. What are the *uses of the clavicle?*

A. It supports the shoulders, and keeps them at a proper distance from the trunk, that the motions of the arms may be more extensive: it defends the *sub-clavian artery*, *vein*, and *nerves*, and gives attachment to various muscles.

Q. What is the *state* of the clavicle *in the foetus?*

A. It is completely formed.

OF THE SCAPULA.

Q. Where is the scapula situated?

A. On the superior and posterior part of the thorax.

Q. What is the form of the scapula?

A. It is triangular; its longest side or base is placed towards the spinous processes of the vertebrae; its second longest, or inferior costa, before; and its shortest and most uneven side, named its superior costa, above.

Q. Describe the *scapula?*

A. Its venter, or inner surface, is concave, corresponding to the convexity of the ribs; and its dorsum or outer surface convex; its inferior angle blunt, its superior and posterior acute, and the glenoid cavity occupies the anterior angle.

Q. Which *costa* is the thickest?

A. The anterior or inferior.

Q. Between what ribs is the scapula extended?

A. Its superior or cervical costa is nearly opposite to

the second rib, and its inferior angle extends downwards to the eighth, in the natural easy mode of sitting erect, with the arms in their natural depending position.

Q. Where is the *semilunar notch?*

A. Near the anterior part of the superior costa, at the root of the *coracoid* process.

Q. What *vessels* does it transmit?

A. The *dorsalis superior scapŭlae artery,* its corresponding *vein,* and the *nerve,* named *scapularis.*

Q. How many *processes* has the scapula?

A. Three; the *spine,* small at its beginning, and rising higher in its course forwards; the *acromion* process, arising from the termination of the spine; and the *coracoid,* arising from the neck in a line with the superior costa.

Q. What are the names of the parts near to the *glenoid cavity?*

A. The anterior and superior angle terminates in the *cervix,* and adjoining is the *head,* which contains the *glenoid cavity.*

Q. What *sinuosities* has it?

A. Two very conspicuous; one large, under the acromion around the cervix; and the other smaller, under the root of the coracoid process in the hollow of the cervix.

Q. What purpose does the *head serve?*

A. It forms the oval prominent brim of the glenoid cavity.

Q. What occupies the *great sinuosity* under the acromion?

A. The *infra* and *supra-spināti* muscles pass in it.

Q. What occupies the *sinuosity* under the coracoid process?

A. The *sub-scapularis* muscle passes over it.

Q. What muscles are attached to the end of the coracoid process?

A. The *short head* of the *biceps flexor cubĭti,* and the *corăco-brachiālis,* arise from it; and the *pectoralis minor* is inserted into it.

Q. Do any *ligaments* arise from the coracoid process?

A. Three; the *proper anterior triangular ligament*, which passes transversely from its side, to be fixed to the posterior margin of the acromion; the *ligamentum conoidēum*, which arises from the root of the coracoid process, and is fixed to the tubercle of the clavicle; and the *ligamentum trapezoidēum*, arising from the point of the coracoid process, is fixed to the under edge of the clavicle.

Q. What muscle is attached to the base above the spine of the scapulae?

A. The *levātor scapŭlae*.

Q. What *muscles* are attached to the *inferior angle?*

A. The *teres major* arises from it; and the *latissimus dorsi* passes over it.

Q. What muscle is attached to the *triangular space* between the root of the spine and the base?

A. Part of the insertion of the *trapezius*.

Q. What muscle arises from the *inferior* or *anterior costa* of the scapula?

A. The *teres minor*.

Q. What muscles arise from the cavities above and below the *spine?*

A. From the large sinuosity above the spine the *supra-spinatus* arises: and from the other below it on the dorsum scapŭlae, the *infra-spinatus* arises.

Q. What muscle is attached to the concave surface of the scapula?

A. The *sub-scapularis* arises from its three costae, and whole inner surface.

Q. What muscle arises from the superior edge of the glenoid cavity?

A. The *long head* of the *biceps flexor cubiti*.

Q. What renders the *glenoid cavity* deeper and more secure?

A. The *cartilage*, which lines it in the recent subject, being much thickened on the brim, deepens it; and ligaments and muscles surrounding it very closely render the articulation more secure.

Q. Why is this *glenoid cavity* not deeper in the bone, and thereby rendered more secure ?

A. That the rotatory motions of the arm may be exercised in every possible direction.

Q. Has this articulation of the shoulder a strong *capsular ligament ?*

A. Yes ; it arises from the neck of the scapula, surrounds the round head of the os humĕri loosely, and is inserted into its neck ; other ligaments also strengthen this.

Q. What are the *connexions* of the scapula ?

A. It is firmly fixed to the clavicle by ligaments ; to the head, os hyoides, trunk and arm by muscles, and to this last also, by its articulation with the os humeri.

Q. What *motions* can the scapula perform ?

A. It can be moved in every direction, upwards, downwards, and to either side ; and has a slight rotatory motion upon the sternum, through the medium of the clavicle, by means of the different muscles attached to it.

Q. What is the *state* of the scapula *in the foetus ?*

A. The acromion and coracoid processes and head are cartilaginous, and are joined by epiphysis to the body of the bone.

OF THE OS HUMERI.

Q. What are the figure and situation of the *os humeri ?*

A. It is roundish, cylindrical, slightly twisted, and nearly straight ; and situated at the side of the trunk of the body.

Q. How is the *os humeri divided ?*

A. Into a head, body, and lower extremity.

Q. Describe the *head* of the humerus ?

A. It is round, and nearly a semicircle, situated on the upper and ulnar aspect, terminated by a circular depression, called its neck.

Q. What occupies the circular depression of the neck of the humerus ?

A. The capsular ligament, which is inserted into it all round the head.

Q. Where is the long groove?

A. It comes from the head, along the fore or radial, and inner or thenal aspect of the bone, about three or four inches.

Q. What occupies that *long groove?*

A. The *tendon* of the long head of the *biceps flexor cubiti* plays in it.

Q. Has the os humeri any *tubercles* near its head?

A. Yes, two; the smaller tubercle, situated on the inner or thenal aspect of the groove; and the larger, on the outer or radial aspect of it.

Q. What parts are attached to these *tubercles?*

A. The *sub-scapularis* is inserted into the smaller; and the *supra-spinatus*, *infra-spinatus*, and *teres minor*, are inserted into the larger tubercle.

Q. Has the *body* of the os humeri any *ridges* upon it?

A. It has four; a rough ridge, gently flattened in the middle, runs down from each tubercle along the sides of the groove; a large ridge on the radial, and a smaller one on the ulnar aspect of the cubital extremity.

Q. Does any *membrane* stretch across the *groove* between those superior ridges?

A. Yes; a *tendinous sheath* extends across the groove, and confines the tendon of the biceps in its course.

Q. What muscle is attached to the rough ridge on the inner side of the bicipital groove?

A. The *tendon* of the *pectoralis major* is inserted into it.

Q. What muscles are attached to the ridge on its outer side?

A. The *latissimus dorsi*, and the *teres major* are inserted into it.

Q. Describe the surface of the body of the humerus?

A. On the outer part of the bone there is a rough protuberance; interior to this, a flat smooth surface; from which a blunt ridge descends on the fore part; on the

posterior, or anconal aspect, the bone is rather sharp and smooth, diverging into two ridges leading to the two condyles, between which is a flat smooth surface.

Q. What muscles are attached to the anterior rough uneven surface near its middle?

A. The *deltoid* and *coraco-brachialis* are inserted; and the *brachialis internus* arises there.

Q. What muscles are attached to the posterior surface of the body of the humerus?

A. The *second* and *third heads* of the *triceps extensor cubiti* arise from it, and flatten the bone with their fleshy belly.

Q. What vessel enters the foramen near the middle of the humerus?

A. The medullary artery penetrates it slanting obliquely downwards.

Q. What muscles are attached to the *large ridge* descending to the *radial condyle?*

A. The *supinātor radii longus*, and the *longest head* of the *extensor carpi radialis* arise from it.

Q. What arises from the smaller *ulnar ridge?*

A. A strong *tendinous fascia* arises from it, which gives origin to muscles of the fore arm.

Q. Describe the *cubital extremity of the os humeri?*

A. It has *two condyles*, of which the ulnar or inner is by much the larger; between the condyles is the *trochlea* or pulley, consisting of two lateral circular protuberances, of which the inner is the higher, and a middle sinuosity; and between the outer protuberant circle and the condyle is a rounded articular head, with a circular depression separating it from the articular trochlea.

Q. Has it any *cavities?*

A. It has two considerable cavities, of which the posterior or anconal is by far the larger.

Q. What *muscles* are attached to the *external* or *radial condyle?*

A. It gives origin to the extensors and supinators of the hand and fingers, namely, the *extensor carpi radialis brevior*, *extensor carpi ulnaris*, and the *extensor*

digitorum communis; the *anconēus* and *supinator radii brevis.*

Q. What *muscles* are attached to the *internal condyle?*

A. It gives origin to the flexors and pronators of the hand and fingers, viz. the *flexor carpi radialis, flexor carpi ulnaris,* part of the *flexor digitorum sublimis* vel *perforatus, pronator radii teres,* and *palmaris longus.*

Q. What is the *purpose* of the *trochlea?*

A. It is smooth and covered with cartilage in the recent subject, and articulated with the ulna by a corresponding trochlear part.

Q. What is applied to the *round articular head* adjoining to the trochlea?

A. The *upper* or *cubital end* of the *radius* plays upon it in flexion and extension of the elbow-joint.

Q. What occupies the *anterior* and *posterior cavities?*

A. The anterior cavity receives the *coronoid process* of the ulna in tho flexion of the fore-arm: the posterior receives the *olecranon process* in extension of it.

Q. Is this articular surface of the os humeri directly transverse?

A. The side of it toward the ulnar aspect is longer or farther distant from the head of the bone, which renders the articulating surface considerably oblique; by which obliquity, the hands, when raised without any turning of the os humeri, are directed towards the face, breast, or simply laid across as they descend.

Q. What *motions* does the *elbow-joint* admit of?

A. It is a complete hinge, and admits of flexion and extension of the fore-arm only.

Q. What is the *state* of the os humeri *in the foetus?*

A. Its extremities are cartilaginous, its head with the tubercles, and its condyles with the trochlea, are detached, and afterwards unite to the body of the bone by epiphyses.

Q. What are the *connexions* of the os humeri?

A. It is connected above to the scapula; below to the ulna by the articular surface of the trochlea, and to the

radius by the round head adjoining to the radial side of the trochlea.

OF THE ULNA.

Q. What bones compose the foro-arm ?

A. The *ulna* and *radius*.

Q. What is the *situation* of tho ulna ?

A. At the inner or ulnar aspect of the fore-arm in its easy depending state.

Q. How is the *ulna divided ?*

A. Into two extremities and a body.

Q. What *processes* are on its cubital extremity ?

A. Two large processes, the *olecranon* and *coronoid,* and one smaller *tubercle.*

Q. Where is the *olecranon* situated ?

A. It forms the posterior prominent part of the elbow, and has a rough surface at its end.

Q. Where is the *coronoid process* situated ?

A. At the fore, or thenal, aspect of the bone, it projects sharp, but not so high as the olecranon.

Q. Where is the *tubercle* situated ?

A. On the fore part of the ulna near to the root of the coronoid process, it appears small and rough.

Q. How many *cavities* are observable on the cubital extremity of the ulna ?

A. Two ; the *great* and the *small sigmoid,* or semilunar *cavities.*

Q. Where is the *great sigmoid* cavity situated ?

A. Between the olecranon and coronoid processes, and divided by a middle ridge into two slanting surfaces.

Q. Where is the *small sigmoid* cavity situated ?

A. At the outer or radial side of the coronoid process.

Q. What *parts* are attached to the *olecranon* process ?

A. The *triceps extensor cubiti* is inserted into its whole posterior surface.

Q. What is attached to the *coronoid* process ?

A. The strong short *tendon* of the *brachialis internus* is inserted into it.

Q. What is attached to the *rough tubercular spot* of the ulna ?

A. Part of the insertion of the *brachialis internus* is extended down to it.

Q. What is the *use* of the *great sigmoid* cavity?

A. It is lined with cartilage, and nicely adapted to the trochlea of the humerus, to form the articulation of the elbow joint.

Q. What is the *use* of the *small sigmoid* cavity?

A. It is adapted to the round head of the radius, which plays in it when performing its rotatory motions.

Q. What is the *form of the body* of the ulna?

A. It is triangular, becoming gradually smaller towards its carpal extremity, and having its sharpest angle opposed to the radius.

Q. What is the appearance of its sides?

A. They are flat, and marked by the attachment of muscles: there is a foramen slanting upwards on the thenal aspect.

Q. What is attached to the *angle* opposed to the radius?

A. The *interosseous ligament.*

Q. What *vessel* enters the *slanting foramen?*

A. The *medullary artery.*

Q. What parts are observable on the *carpal extremity* of the ulna?

A. A small *round head*, and a *styloid process.*

Q. What is the *round head* connected with?

A. It is adapted to a corresponding cavity on the side of the radius, in which it plays during the motions of pronation and supination of the hand.

Q. What is attached to the *styloid process?*

A. This process, situated at the inner or ulnar side of the round head, gives attachment to a *strong ligament* to be inserted into the *os cuneiforme* and *pisiforme* of the carpus.

Q. Has this carpal extremity any *sinuosities?*

A. It has two, one on the anconal or posterior aspect, and another on the thenal or anterior.

Q. What occupies the *sinuosity* on the *anconal aspect?*

A. The *tendon* of the *extensor carpi ulnaris.*

Q. What is placed in that on the *thenal aspect?*

A. The *ulnar artery* and *nerve* lie in it in their passage to the hand.

Q. What is the *use of the ulna?*

A. It forms the *articulation of the elbow-joint* with the *os humeri* like a hinge, termed *ginglimus;* it strengthens the fore-arm, and with the radius rolling upon it, renders the hand capable of pronation and supination; is articulated with the *os cuneiforme* of the carpus, and assists in forming the articulation of the wrist.

Q. What are the *connexions* of the ulna?

A. It is connected with the humerus above, with the radius laterally, and with the os cuneiforme at the carpus.

OF THE RADIUS.

Q. Where is the radius situated?

A. At the outer side of the fore-arm, in a line with the thumb.

Q. How is the radius *divided?*

A. Into a head, cervix, body, and lower or carpal extremity.

Q. What is the form of its *head?*

A. It is circular, hollowed in the end applied to the os humeri, and has a smooth surface on its circumference to the extent of a fourth part of it.

Q. What is observable on the *cervix?*

A. The cervix is much smaller than the head, and impressed with a rough surface.

Q. Why is the *vertex* of the head of the radius *hollowed?*

A. That it may be adapted to the round head in the articular surface of the os humeri, around which it plays in flexion and extension of the fore-arm; and at any degree of flexion or extension it may be capable of a rotatory motion for pronation and supination.

Q. What is the *use* of the *articulating surface* on the circumference of the head, and what part is it applied to?

A. It is received into the small *semilunar* or *sigmoid cavity* on the side of the ulna, and plays in it during pronation and supination of the fore-arm.

Q. What is the *use* of the cervix?

A. It is surrounded by the *capsular ligament*, which is firmly attached to it in such a manner as to permit the various movements of the head of the bone.

Q. Has the radius any *processes?*

A. It has two; a *tubercle* of considerable size about an inch from the cervix on the ulnar aspect; and *another process*, at the carpal extremity on the outer or radial aspect of the fore-arm, stronger but not unlike the *styloid process* of the ulna.

Q. What is attached to the *tubercle?*

A. The *tendon* of the *biceps flexor cubiti* is inserted into it.

Q. Describe the *body* of the radius?

A. It is *round* and *convex* on its outer side, forming the segment of a large circle from its cervix to its carpal extremity; has a *sharp ridge* on its ulnar aspect, with a *flat surface* a little hollowed on either side of it.

Q. Why is the *radius round* and *convex* on its outer or radial aspect?

A. It is made round by the pressure of the circumjacent muscles, particularly the extensors of the hand; is made convex the better to resist external injuries, and to make room for the muscles situated on its inner or ulnar surfaces.

Q. What is attached to the *sharp spine?*

A. The interosseous ligament.

Q. What *muscles* arise from the *anterior surface* of the radius?

A. The fleshy belly of the flexor digitorum sublimis, and flexor longus pollĭcis manus.

Q. What muscles occupy the posterior surface?

A. The extensor digitorum communis, and extensor carpi radialis brevior.

Q. Describe the *inferior* or *carpal extremity* of the radius?

A. It is larger than the head, flat before, and rising

at the extremity; has a ridge behind with a depression on either side; has a semilunar depression on its ulnar and a styloid process on its radial aspect; and in the end an oval cavity, with a slight transverse middle ridge.

Q. What is placed on its *flat anterior surface?*

A. The pronator radii quadratus covers it, and the tendons of the flexors of the hand and fingers play over it.

Q. What is attached to the *middle ridge* on the anconal aspect of the carpal extremity?

A. The *annular ligament* for binding the tendons in their places.

Q. What occupies the *depressions* at either side of it?

A. The tendons of the extensor muscles of the hand.

Q. What is placed in its *inner semilunar cavity?*

A. It receives the rounded carpal extremity of the ulna, which rolls in it in pronation and supination of the hand.

Q. What occupies the *articular cavity of the end?*

A. Two bones of the carpus, namely, the os scaphoides, and os lunare.

Q. What is attached to the *styloid process* of the radius?

A. A strong ligament binding it to the bones of the carpus.

OF THE CARPUS.

Q. How are the bones of the hand commonly arranged?

A. Into those of the carpus, metacarpus, and fingers.

Q. What is the general appearance of the hand?

A. It is convex behind, and concave before.

Q. Why is it concave?

A. That it may be the better adapted to grasp and hold things.

Q. How many bones is the *carpus* or *wrist* composed of?

A. Of *eight*, arranged in two rows.

Q. Enumerate those of the *first row*, nearest to the radius?

A. The os scaphoides, lunare, cuneiform, and pisiforme.

Q. Describe the situation and connexions of the *os scaphoides?*

A. It is situated in the radial or outer side of the carpus, having a large *round convex superior surface*, adapted to the cavity in the extremity of the radius; and a projecting *hook-like process* upon its outer part, and is connected with the os lunare internally, and the trapezium and trapezoides below.

Q. Describe the situation and connexions of the *os lunare?*

A. It is situated at the inner side of the os scaphoides, has a roundish superior surface joined to that of the scaphoides, and with it forming an oval ball, fitting the socket of the radius; its lunated edge is towards the second row.

Q. Describe the *os cuneiforme* and its connexions?

A. Its thin edge is towards the palm, its upper part is slightly convex, and adapted to the hollowed end of the ulna; its anterior part has an orbicular spot to be connected with the os pisiforme; it is situated on the inner side of the os lunare.

Q. Describe the *os pisiforme* and its connexions?

A. It is small and roundish, placed on the anterior and inner surface of the os cuneiforme, projects into the palm and can be felt externally.

Q. What bones then form the *joint of the wrist?*

A. The upper surfaces of the os scaphoides, and lunare together, making an oval convex ball, nicely fitted to the cavity in the extremity of the radius, form the chief articulation; but the slightly convex surface of the os cuneiforme is also articulated with the hollow end of the ulna, and thus the whole articulation is completed.

Q. Enumerate the *bones of the second row* of the carpus?

A. The os trapezium, trapezoides, os magnum, and unciforme.

Q. Describe the *trapezium* and its connexions?

A. It is pretty large, of an irregular form, situated on

the radial aspect; its upper convex part is connected with the hollow of the os scaphoides, and its inner with that of the trapezoides; its inferior and rather external surface is hollow, with a middle transverse ridge like a pulley, to be articulated with the *metacarpal bone of the thumb;* and from its anterior and external part it sends out a kind of *styloid process* towards the palm.

Q. What are the connexions of the *os trapezoides?*

A. It is wedged in between the trapezium and os magnum, is connected with the convex under surface of the os scaphoides above, and forms a pulley-like cavity below for the reception of the *metacarpal bone* of the *fore-finger.*

Q. Describe the connexions of the *os magnum?*

A. It has a round convex head, articulated with the hollow surfaces of the os lunare and scaphoides above, and having the trapezoides on its outer, and the os unciforme on its inner side, it presents a slightly hollowed surface below for the articulation of the *metacarpal bone* of the *middle finger.*

Q. Describe the connexions of the *os unciforme?*

A. It is wedged in between the os magnum and the os cuneiforme; sends out a *hook-like process* towards the palm; has two concave surfaces below, with which the *metacarpal bones* of tho *ring* and *little finger* are articulated.

Q. What substance connects all those carpal bones together?

A. All their articular surfaces are covered with cartilage, and they are bound to each other also by all forms of cross ligaments.

Q. What prominent points is the *ligamentum carpi annulare* attached to?

A. It is attached chiefly to four, namely, the eminences of the os scaphoides, and trapezium, on the outer or radial aspect; and to those of the os pisiforme and unciforme on the inner or ulnar aspect.

Q. Is not the *annular ligament* attached to more points than those four?

A. It is also firmly fixed to all the bones of the car-

pus, and in such a manner as to afford sheaths for the tendons of the different muscles, passing to the fingers, playing easily in.

Q. What *motions* can the articulation formed by the radius, ulna, and carpal bones perform?

A. The construction of the joint is ball and socket, in an oblong or oval form; in consequence, it can perform motions in every direction, but to greatest extent perpendicularly to the long axis of the cavity, *i. e.* flexion and extension of the wrist.

Q. Do the bones of the carpus move upon each other?

A. Yes; the articulation of the os magnum with the os scaphoides and lunare above, being that of ball and socket, admits of motions in every direction, and its lateral connexions admit of motions radiad and ulnad, so that the hand can readily perform rotatory movements.

OF THE METACARPUS.

Q. How many bones compose the metacarpus?

A. *Four* for the fingers, and one for the thumb.

Q. How are they *divided?*

A. Into a base, body, and head.

Q. Describe the *base of the metacarpal bones?*

A. The base of the metacarpal bone of the *fore-finger* is a little hollow with a ridge on its inner side, and a lateral surface; the base of that of the *middle finger* is oblique and triangular, with two lateral surfaces; the base of that of the *ring-finger* irregularly triangular and small, with two lateral surfaces, and the base of that of the *little-finger* slants downwards and outwards, and has no lateral surface.

Q. Describe the *bodies* of the metacarpal bones?

A. They are long, roundish, and convex towards the back of the hand; concave and ridged towards the palm, with a flat surface on each side. That of the fore-finger is the longest, and they diminish in length towards the little-finger.

Q. Describe their *heads?*

A. The heads, or *digital extremities*, of the metacarpal bones, are larger than their bodies, and form round balls flattened on their sides, where they are in contact with each other; from the anterior part of each side of the heads a little prominence arises, to which ligaments are attached for binding the bones together; around their heads is a depression for the insertion of the capsular ligament.

Q. What are the *connexions* of the metacarpal bones?

A. They are connected with the bones of the carpus by capsular ligaments, with each other on nearly plain surfaces by strong ligaments, and with the fingers.

Q. What *muscles* lie between the metacarpal bones?

A. The *interossei.*

Q. What muscles are inserted into the metacarpal bones before and behind?

A. The *tendon* of the *flexor carpi radialis* is inserted into the fore and upper part of that of the fore-finger, and that of the *extensor carpi radialis* into its back part; that of the *extensor carpi ulnaris* into the upper and back part of the metacarpal bone of the little finger; while the tendon of the *flexor carpi ulnaris*, and *palmaris brevis*, are inserted into the pisiform bone, on the fore part.

Q. Do the *articulations* of the metacarpal bones admit of much *motion?*

A. No: Those of the fore and middle fingers are nearly fixed; those of the other fingers have a greater degree of motion.

Q. In what does the metacarpal bone of the THUMB differ from that of the fingers?

A. Its *base* forms a ball articulated with the concave pulley of the os scaphoides, in which it performs motions in every direction; its *body* is thicker and shorter than those of the fingers; it stands out obliquely, and inflexion comes in opposition to the fingers.

Q. How can a joint formed by two lateral depressions and a middle ridge, and a ball fitted to them, perform free motions in every direction?

A. The articulation may be regarded as double, com-

posed of two sockets and a ball fitted to each: the capsular ligament is loose, and when the thumb is directed towards the palm it rolls in the socket nearest the palm, when directed towards the back of the hand it rolls in the cavity nearest that aspect, and when bent or extended in its natural position, it moves equally in both sockets.

OF THE FINGERS.

Q. How many bones are in each finger and thumb?

A. Each finger is composed of *three bones*, and the thumb of *two*.

Q. How are these bones arranged?

A. Into three phalanges: those attached to the metacarpal bones compose the first phalanx; the next transverse row the second, and those at the ends of the fingers compose the third phalanx.

Q. What is the general appearance of these *phalanges*?

A. Their bases are larger than their distant extremities, their posterior surface convex, their anterior flat and in some parts grooved; and they taper a little towards their points.

Q. How are the *bases* of the *first phalanx* articulated with the metacarpal bones?

A. Their ends are formed into sockets to receive the round balls of the metacarpal bones, and are bound together by capsular ligaments.

Q. What motions are performed at their bases?

A. The ball and socket being irregular, are fitted for motions of flexion and extension most freely; or a considerable degree of lateral, and also of circular motion.

Q. What is the *form* of the *distant extremity* of the first phalanx of the fingers?

A. Each bone has a round prominence like a condyle on either side of its distant end, with a depression between them.

Q. Is the construction of the second phalanx adapted to this?

A. Yes; the *bases* of the *second phalanx* have two

lateral cavities, and a middle prominence, which answer exactly to the extremities of tho first.

Q. Is the construction of tho *most distant joint* of the fingers the same?

A. Yes; the ends of tho second phalanx are round on each side, and the baso of the third phalanx is hollowed to receive them.

Q. What is the *form* of the *second bone* of the *thumb*, corresponding to the first phalanx of the fingers?

A. It has a large base with an oblong cavity, a convex body behind, and flat before, a distant extremity with two round lateral protuberances and a middle cavity.

Q. Is the most distant bono of the thumb articulated with the last as the fingers are?

A. Yes; exactly similar.

Q. What *motions* does the *second bone of the thumb* perform in its articulation with the metacarpal bone?

A. Its hollow socket being much lengthened from side to side, and of considerable depth, receives the oblong round end of the metacarpal bone, and being firmly bound in its situation by lateral ligaments, it performs flexion and extension chiefly, and but a very small degree of lateral motion.

Q. What *muscle* is attached to the back, or convex part, of the fingers?

A. The *extensor digitorum communis*, by a tendinous expansion, is inserted into all the phalanges behind.

Q. What muscles are attached to tho palmer part of the fingers?

A. The *interossei* and *lumbricales* are inserted on the lateral parts of the fingers to bend the *first phalanx*; the *flexor digitorum sublimis* vel *perforatus*, is inserted into the fore part of the *second phalanx*; and the tendons of the *flexor digitorum profundus* vel *perforans*, pass under the tendinous sheaths of the sublimis, run in the grooves defended by a ligamentous sheath from pressure, and are inserted into the *third phalanx* of the fingers.

Q. Is the surface of the third phalanx of the fingers smooth, or what?

A. It is rough where the nail, the vascular, nervous, and pulpy substance are situated.

Q. Are there not *ossa sesamoidea* sometimes found connected with the fingers?

A. Yes; small bones are sometimes found between the tendons of the flexor muscles and the joints at the roots of the fingers, and of the second bone of the thumb.

Q. What *purposes* do these *ossa sesamoidea serve?*

A. They are convex, and enclosed by the tendons externally; are concave and adapted to the joint, upon which they play, internally; and seem destined to increase the power of the muscle by lengthening the lever upon which it acts, and to facilitate its movements over the joint.

OF THE INFERIOR EXTREMITIES.

Q. How are the bones of the inferior extremity *arranged?*

A. They are commonly classed into those of the *thigh*, the *leg*, and the *foot*.

Q. How many bones compose the *thigh?*

A. One, namely the *os femoris*.

Q. How many compose the *leg?*

A. Two; the tibia and fibula.

Q. How are the bones of the *foot* subdivided?

A. Into the bones of the tarsus, metatarsus, and toes.

Q. How many bones compose the *tarsus?*

A. Seven; namely, the astragalus, os calcis, naviculare, cuboides, cuneiforme externum, cuneiforme medium, and cuneiforme internum.

Q. How many bones does the *metatarsus* consist of?

A. Of five metatarsal bones, corresponding to the toes.

Q. How are the bones of the *toes arranged?*

A. Into three phalanges, excepting the great toe, which has two bones, as in the thumb.

OF THE OS FEMORIS.

Q. What are the form and situation of the *os femŏris ?*

A. It is long, thick and strong, and situated at the under and lateral part of the pelvis; it stands obliquely, being much nearer tho mesial perpendicular of the trunk below, than above.

Q. How is the os femŏris *divided?*

A. Into an upper, and lower extremity, and a body.

Q. What parts of the *upper end* of it require particular attention?

A. Its head, cervix, the trochanter major, et minor.

Q. Describe the *relative situation* of these parts?

A. The *head* is the smooth round upper end of the bone; the *cervix* considerably smaller adjoining to the head, and stands off from the body at an angle of about 45 degrees; the *trochanter major* is a large tuberosity situated on the angle towards the outer side, in a line with the body of tho femur; the *trochanter minor* is situated about two inches lower at the under and inner part of the root of the cervix.

Q. What is observable on the *head?*

A. Its rotundity is about three fourths of a sphere; it is smooth, and has a rough pit a little below its centre.

Q. What is worthy of notice on its *cervix?*

A. The cervix is long, rough, and has numerous holes for the insertion of a ligament reflected from the capsular one.

Q. What is attached to the *rough pit* on the head of the femur?

A. The *ligamentum teres*, or round ligament, is inserted into it, and attached by its other end to the bottom of the acetabulum, in order to keep the head firmly in the socket.

Q. What purpose does the *trochanter major* serve?

A. It is placed on the outer part of the angle, and by increasing the lever it gives the muscles attached to it much greater power of action.

Q. What *muscles* are attached to it?

A. On its anterior rough surface the *glutĕus minĭmus* is inserted; on its superior part the *glutēus medius;* the tendon of the *glutĕus maxĭmus* passes over its posterior part.

Q. Are any *cavities* placed at the root of the cervix under the prominent extremity of the trochanter major?

A. There is a large and deep cavity at its posterior part, and more superficial at its anterior.

Q. What parts are attached to it?

A. The tendons of the *obturātor externus*, and obturator *internus*, of the *pyriformis*, and of the *gemini*, are inserted into it.

Q. What is attached to the oblique *rough line* between the trochanters before and behind?

A. The *capsular ligament* is inserted there.

Q. What is attached to the *rough ridge* running downwards from the posterior and outer part of the great trochanter?

A. The *quadratus femŏris* is inserted there.

Q. What are the form and situation of the *trochanter minor?*

A. It is a pointed, roundish, papilla-looking process, situated an inch and a half, or two inches at most, below the great trochanter, at the posterior part of the femur, and pointing inwardly.

Q. What purposes does the *trochanter minor* serve?

A. It gives attachment to various flexor muscles of the thigh.

Q. To what muscles?

A. The tendons of the *psoas magnus*, and *iliacus internus*, and part of that of the *pectinālis* are inserted into it.

Q. Describe the *body of the os femŏris?*

A. The body of the femur is long, bent a little forwards, round and flattish before; and forms an angle on which is a rough ridge behind, called the *linea aspĕra*, on either side of which the bone is somewhat flat.

Q. What occupies the smooth flattish anterior part of the femur?

A. The *crurālis*, and *rectus* muscles.

Q. What forms the *līnea aspĕra?*

A. The insertions and origins of several muscles.

Q. What muscles are inserted into it?

A. The *triceps adductor femŏris*, the *glutēus maximus*, and part of the *aponeurosis femoris* are inserted into the linea aspera.

Q. What muscles arise from it?

A. The *vastus externus*, and *internus*, and the short head of the *biceps flexor cruris*.

Q. What is situated on the flat surfaces on each side of the linea aspera.

A. The *vastus externus* on the one side, and the *vastus internus* on the other.

Q. Describe the *inferior end* of the *os femŏris?*

A. About five inches from the extremity in an ordinary sized bone, the linea aspera divides into two lines, each of which terminates in the lateral part of the condyles: tho intermediate space is triangular; the end of the bone is much enlarged, particularly in breadth.

Q. Describe the *condyles* of the os femoris?

A. They are two large protuberances with a smooth articular surface on their circumference, having a cavity deep enough to conceal one's thumb between them, the internal condyle is longer and larger than the external; they have the articular surfaces higher on their anterior part, with a smooth depression between them.

Q. Why is the internal condyle lower than the external?

A. To compensate for the oblique direction of the body of the femur approximating its fellow from above downwards; and that the leg may stand parallel to the axis of the trunk.

Q. What are situated in the *cavity* between the condyles?

A. The *poplitēal artery, vein*, and *nerves* pass through it; and the two *crucial ligaments* arise from its bottom and roots of the condyles towards its anterior part.

Q. What is *lodged* on the *smooth hollow* surface between the anterior parts of the condyles?

A. The small bone, named *patella*, or rotŭla, moves round in it as a rope in a pulley.

Q. What purposes does the *patella* serve there?

A. It is a medium, by means of which the tendons of the extensor muscles of the leg, playing easily in the hollow surface between the condyles on the fore part of the joint, are removed farther from the centre of motion, and their lever in consequence being lengthened, they have greater power of action.

Q. How do the *vessels enter* for the nutrition of the femur?

A. There is a *hole* or *canal* slanting upwards about the middle and posterior part of the femur, where the *medullary vessels* enter; and sometimes various other holes in different parts of the bone for the same purpose.

Q. What is attached to the rough surface on the margin of the condyles?

A. The *capsular* and other *ligaments* are attached there.

Q. What *use* do the crucial ligaments serve?

A. They strengthen the joint, limit its motions, prevent the leg from going beyond a straight line forwards; and allow the toes to be turned outwards, but not inwards.

Q. What are the *motions of the knee-joint?*

A. *Flexion* and *extension* chiefly; and in flexion a slight degree of rotatory motion of the toes of the foot outwards.

Q. What *ligaments*, besides the capsular and crucial ligaments, secure the knee-joint?

A. Various strong *lateral ligaments* on each side, and the *ligamentous expansion* of the *tendons* of the muscles from the patella, secure this joint most firmly.

Q. Are its condyles and the inferior surface of the patella covered with *cartilage*?

A. Yes; they are all covered.

Q. What *muscles* are attached to the posterior triangular space above the condyles?

A. The *gastrocnemius externus*, and *plantāris*, arise

there, and also from the tuberosities on the upper and lateral part of the condyles.

Q. What is the *structure* of the *os femoris?*

A. It is spongy at the extremities, consisting of innumerable cancelli; its middle is composed of a dense thick outer shell, and a medullary canal within.

Q. What are the *connexions* of the os femoris?

A. It is connected above to the os innominatum, and below to the tibia.

Q. What is the *state* of the os femoris *in the foetus?*

A. Its different processes are cartilaginous, and afterwards form large epiphyses.

OF THE PATELLA OR ROTULA.

Q. What is the figure of the patella?

A. It is triangular, or heart-shaped, with its apex downwards; its anterior convex surface is perforated by a great number of holes, its posterior surface has a longitudinal prominent ridge with a cavity on either side, corresponding to the condyles of the femur, and forming a trochlea.

Q. What is its situation?

A. The patella plays upwards and downwards on the fore part of the joint of the knee.

Q. Do the *situation* and *office* of the patella resemble those of *sesamoid bones?*

A. Yes, very much indeed; the patella may very justly be regarded as the sesamoid bone of the combined tendons of the rectus, crurālis, and vasti muscles of the thigh, by means of which they play easily and freely over the knee joint in the extensions and flexions of the leg.

Q. What is the use of the numerous holes on its convex surface?

A. The tendons and ligaments, which cover it, are inserted into them.

Q. What is inserted into its rough circumference?

A. The *capsular ligament*, and the tendons of the *rectus*, *cruralis*, *vastus externus*, and *internus*.

Q. How happens the patella to be able to bear the force of these strong muscles?

A. The bone itself is of a compact texture, but the ligaments and the aponeurotic expansion of the combined tendons of the muscles cover it, adhere firmly to its anterior surface, and render it very strong.

Q. Is the *patella* ever *fractured?*

A. Yes; when these strong muscles act suddenly upon it, while the joint is half bent, they sometimes fracture it across.

Q. What binds it to the bones below?

A. That strong aponeurotic tendinous expansion, and strong ligaments bind it firmly to the tibia.

Q. What *motions* does the patella perform?

A. It can be moved by the motions of the leg upwards and downwards freely, and it can be moved a little to either side.

OF THE TIBIA.

Q. What is the situation of the tibia?

A. It is situated at the inner side of the leg.

Q. What is its form?

A. It has been compared to a pipe; being long, somewhat triangular, and greatly enlarged at its upper end.

Q. How is it commonly *divided?*

A. Into an upper, and an under extremity, and a body.

Q. Describe the *upper end of the tibia?*

A. Its upper surface has two superficial cavities, and a rough protuberance between them, with a rough porous circumference.

Q. How can the large condyles of the femur rest securely on these *superficial cavities?*

A. They are considerably deepened by two *semilunar cartilages* much thickened at their convex margin.

Q. What is attached to the *rough protuberance* between the articular cavities of the tibia?

A. The *anterior* and *posterior crucial ligaments* are inserted into its anterior and posterior parts.

Q. What is attached to the porous rough circumference?

A. The *capsular ligament* is inserted there.

Q. What is attached to the *anterior protuberance* a little below the articular surfaces?

A. The strong tendinous *ligament of the patella*, and, on its scabrous inner side, the *tendons* of the *semitendinosus*, *gracilis*, and *sartorius* muscles, and the *aponeurosis* of the *vastus internus*, are inserted into it.

Q. What is applied to the *circular flat surface* below the external articular surface?

A. The *head* of the *fibŭla* is articulated there with the tibia.

Q. Describe the *body of the tibia*?

A. It is triangular, with the sharpest angle or spine anterior and a little bent, extending from the tubercle to the inner ankle; its anterior and inner side smooth and covered only by the integuments; its outer and posterior surfaces a little hollowed.

Q. What is attached to the posterior and outer angle of the tibia?

A. The *interosseous ligament*.

Q. Where, and in what direction is the *canal* for the entrance of the *medullary vessels*?

A. The canal is situated at the inner or posterior part a little above the middle of the bone, and is directed downwards.

Q. How are the *posterior* and *outer sides hollowed*?

A. The anterior and outer surface is hollowed by the *tibiālis antĭcus* above, and below by the *extensor longus digitorum*, and the *extensor proprius pollĭcis*. The posterior is flattened and hollowed by the *tibiālis postĭcus*, and the *flexor longus digitorum*.

Q. Enumerate the parts deserving attention at the *under end of the tibia*?

A. It is much smaller than the upper end, its extremity is hollow, its inner and forepart produced forming the *malleŏlus internus;* a pit in the point of the malleolus; a groove behind it; at its outer side, a semicir-

cular depression, and a rough circumference of the articular cavity.

Q. What is *lodged* in its *hollow articular cavity?*

A. It receives the *convex round surface* of the *astragalus.*

Q. What purposes do the prolonged *process* forming the *mallcŏlus internus*, and the pit in its point, serve?

A. The *mallcŏlus internus* guards the articulation in such a manner, that the joint cannot be luxated with the foot turned inwards, without *this process* of the tibia being *fractured*; the *internal lateral ligament* is attached to the *pit* or notch at the point of the malleŏlus.

Q. What occupies the *groove* behind the malleolus internus?

A. The *tendon* of the tibialis postīcus plays in it.

Q. What occupies the *semilunar depression*, as if made by the impression of the point of a thumb, on the outer side of the tibia?

A. The *lower end of the fibŭla* is lodged in it.

Q. What is the *use* of the *rough circumference* of the articulation?

A. It is the circular line where the *capsular ligament* is inserted.

Q. What is the *structure* of the tibia?

A. Its upper end is spongy, and covered by a thin compact lamella; but its body has a thick, strong, external table, with a cavity for the medulla.

Q. What is the *state* of the tibia in the foetus?

A. Its extremities are catilaginous, and become afterwards epiphyses.

Q. *What parts* of the tibia ought the surgeon *to avoid* in amputation of the leg?

A. The *anterior protuberance*, where the tendons of various muscles are inserted, should be avoided, in order to preserve the action of the muscles; and that *part, where the medullary vessels* are passing in the slanting canal through the hard substance of the bone, should also be avoided, lest the vessels should be divided in the canal, and occasion profuso haemorrhagy, which neither styptics, nor compression can reach to stop.

OF THE FIBULA.

Q. Describe the form and situation of the *fibŭla* ?

A. It is a long slender bone, having three angles, and sides a little twisted; and situated at the outer side of the tibia.

Q. How is the *fibŭla divided* ?

A. Into a head, body, and lower extremity.

Q. Describe its *head* ?

A. The head of the fibula is considerably enlarged, has a superficial, smooth, circular cavity on its inner side; a rough protuberance on its outer side.

Q. What is applied to tho *orbicular surface* on the inside of its head?

A. This part is applied to the circular flat surface on the outer side of the tibia, and firmly secured in its situation by ligaments.

Q. What is attached to the *rough protuberance* on its outer side?

A. The *tendon* of the *biceps flexor cruris*, and the *external lateral ligament*, are inserted into it.

Q. Describe the *body* of the fibula?

A. It is somewhat bent inwards and backwards, having a sharp ridge on the inner part; its surfaces marked by muscles; and a *canal* slanting downwards a little above its middle, on its posterior part, for the entrance of the *medullary vessels*.

Q. What is attached to the *inner ridge* of the fibula?

A. The interosseous ligament.

Q. What *muscles arise* from the anterior side of the fibula?

A. The peronēus longus, peronēus brevis, the peronēus tertius being part of the extensor longus digitorum, and extensor proprius pollĭcis.

Q. What *muscles* arise from the posterior side of the fibŭla?

A. The greater part of the tibiālis postĭcus, flexor longus pollicis, and the outer head of the gastrocnemius internus.

Q. Describe the *under extremity of the fibula?*

A. Its lower end is flat, broad, and smooth on the inside; it sends down a *corŏnoid process*, and has a *sinuosity* behind.

Q. What is the oblong flat smooth surface of the under end of the fibula applied to?

A. It is received into the semilunar depression on the outer side of the tibia, and firmly attached by strong ligaments.

Q. What forms the *malleŏlus externus?*

A. The lower end of the fibŭla, a little enlarged into an oblong head.

Q. Does the *malleŏlus externus* secure and guard the joint in the same manner, as the malleolus internus?

A. Yes; exactly in the same manner, being applied to the outer side of the articulating surface of the astragalus, the *joint cannot be dislocated* outwardly, without the under end of the fibula being fractured.

Q. What is attached to its *corŏnoid process?*

A. *Ligaments*, which go to the bones of the tarsus.

Q. What occupies the *sinuosity* on the posterior part of the malleolus externus?

A. The *tendons* of the peronēi muscles play around it.

Q. What *motions* does the ankle-joint perform?

A. This joint is so constructed, that it is purely a hinge, and performs motions of flexion and extension of the foot only.

Q. What is the *use* of the fibula?

A. It gives attachment to muscles, form and strength to the leg, widens the space for the interosseous ligament, and secures the outer side of the ankle-joint.

Q. What is the *state* of the fibula *in the foetus?*

A. Its extremities are cartilaginous, and becoming epiphyses, grow to the body.

OF THE TARSUS.

Q. How are the *bones of the foot* divided?

A. Into those of the tarsus, metatarsus, and toes.

Q. How many bones compose the *tarsus?*

A. *Seven;* the astragalus, os calcis, naviculare, cuboides, cuneiforme externum, cuneiforme medium, and cuneiforme internum.

Q. What is the form of the tarsus?

A. It forms an arch, being convex above, and concave below.

Q. Describe the situation and form of the *astragalus?*

A. Its head is round, smooth, gently hollowed in the middle, flattened on each side, and articulated with the tibia and fibula; its body is very irregular, having a large concave posterior articulating surface, and an anterior one irregularly convex; and a smooth oblong anterior head.

Q. What is connected with the concave posterior surface of the astragalus?

A. The upper and middle part of the os calcis.

Q. What is opposed to the irregular convex anterior surface of the astragalus?

A. Two smooth cavities at the inner and fore part of tho os calcis, and the *cartilaginous ligament* stretched between the os calcis and os naviculare.

Q. What is its *oblong anterior head* received into?

A. Into the *articulation* with the *os naviculare.*

Q. Describe the form and situation of the *os calcis?*

A. The os calcis is irregular, but somewhat oblong; it is situated under the astragalus, and forms the projection of the heel.

Q. Describe the parts of the os calcis most deserving of attention?

A. The large rough tuberosity projecting backwards forming the heel; the upper smooth convex surface, and two prominences at its fore part, articulated with the astragalus; and an anterior surface articulated with the os cuboides; and a large cavity downwards on its inside.

Q. What is attached to the posterior rough projection of the *os calcis?*

A. The *tendo Achillis.*

Q. Which of the superior prominences gives attachment to the *cartilaginous ligament* fixed to the os naviculare?

A. The posterior of the two at the inner and fore part of the bone.

Q. What parts occupy the *large sinuosity* or *arch* at the inner and under part of the posterior projection?

A. The *tendons* of the flexor longus pollicis, flexor longus digitorum, and peroneus longus; the *artery* named *tibialis postīca*, and *veins* corresponding to it, and the *tibial nerve*.

Q. What *muscles arise* from the tuberosity on the inferior and hollow part of the os calcis?

A. The flexor brevis digitorum, abductor pollicis, abductor minimi digiti, and aponeurosis plantaris.

Q. Do any other muscles arise from the inferior part of the os calcis?

A. The flexor digitorum accessorius, or massa carnea Jacobi Sylvii, arises partly from the sinuosity, and partly from its anterior part, together with the flexor brevis pollicis.

Q. What are the *connexions* of the os calcis?

A. It is firmly articulated with the astragalus by strong ligaments, with the os cuboides before by a concave surface.

Q. What is the situation of the *os naviculare?*

A. It is situated at the anterior part of the astragalus, and inner side of the foot.

Q. How many surfaces has it?

A. A hollow posterior surface for receiving the convex head of the astragalus; three anterior convex surfaces to be articulated with the three cuneiform bones.

Q. Has the os naviculare any *prominences?*

A. A considerable prominence, or tuberosity, directed inwards and downwards.

Q. What parts are attached to that *tuberosity?*

A. The *tendon* of the tibialis postīcus is inserted into it, and the *abductor pollicis* arises from it: the strong *ligament*, which supports the astragalus, is fixed to it,

and also another *ligament* stretched across the metatarsal bones.

Q. What *motions* does the os naviculare perform upon the astragalus?

A. They are adapted to each other by ball and socket, and are capable of performing motions in various directions, turning the toes inwards, raising or depressing one side of the foot.

Q. Where is the *os cuboides* situated?

A. In the anterior and outer part of the tarsus.

Q. How many *articulating surfaces* has the *os cuboides?*

A. Three; a posterior, smooth surface, convex at its inner and concave at its outer part, corresponding to the os calcis; its inner, articulated with the os naviculare and the os cuneiforme externum; and its anterior surface, divided into a small inner, to be articulated with the fourth, and a large outer, articulated with the fifth metatarsal bone of the little toe.

Q. What is the appearance of the under surface of the os cuboides?

A. It is rough and irregular; exhibiting a round protuberance, with a knob on its outside, and a fossa, or groove immediately before the knob.

Q. What is attached to the *round protuberance?*

A. The adductor pollicis arises from it, and ligaments are also attached between this bone and the os calcis.

Q. What lies in the *fossa?*

A. The *tendon* of the peronēus longus, while it runs across the sole.

Q. What is the use of the *knob?*

A. The thin flat cartilage, or sometimes a sesamoid bone, plays on the knob, as the tendon turns round it.

Q. What is the situation of the *three cuneiform bones* of the tarsus?

A. They are placed on the inner side of the os cuboides on the fore part of the tarsus, and applied to each other transversely, as stones in an arch.

Q. In what order are they placed?

A. The *os cuneiforme externum* is placed next the os cuboides, but it is named sometimes *medium*, as being of an intermediate size between the other two: the *os cuneiforme medium*, placed in the middle as being the smallest in size, is sometimes named *minimum;* and the *os cuneiform internum*, placed the innermost, is, from its being the largest in size, named sometimes *maximum;* this has its base towards the sole, while the apices of the other two are in that direction.

Q. What is their appearance above?

A. They appear flattish.

Q. What is their under surface?

A. It is concave and irregular, the os internum exhibiting *two* considerable *tubercles*.

Q. What is attached to these *tubercles?*

A. The abductor pollicis arises from, and the tendon of the tibialis posticus is inserted into them.

Q. What is the posterior surface of the cuneiform bones?

A. Their posterior surface is flat, and articulated with the os naviculare.

Q. What is their anterior surface?

A. It is also flat, and articulated with three metatarsal bones.

Q. Describe *their articulations* particularly with the metatarsal bones?

A. The os cuneiforme internum is articulated with the metatarsal bone of the *great toe;* and the os cuneiforme *medium* with that of the *second toe;* and the os cuneiforme *externum*, with that of the *third* or *middle toe;* while the *fourth* and *fifth metatarsal* bones are articulated with the *os cuboides*.

Q. Are cartilages interposed between these bones on their articulating surfaces?

A. They have cartilages between them, and capsular, and other ligaments, binding them very firmly to each other.

Q. Do they admit of much *motion?*

A. Excepting the articulation of the os naviculare with the astragalus, the others are so connected as to

admit of no motion, but of a certain degree of *elasticity*, which, in the different violent motions of the body, prevents disagreeable concussion.

OF THE METATARSUS.

Q. How many bones compose the metatarsus?

A. *Five;* which, in general characters, agree with the metacarpal bones of the fingers.

Q. What is the form of their bases?

A. Their base is large, flat, and a little hollowed, to be articulated with the fore part of the tarsal bones.

Q. What is the form of the bodies of the metatarsal bones?

A. Their body is sharpish above, and flattened at the sides.

Q. What is situated on their oblique flat sides?

A. The *interosseous muscles* arise from them.

Q. What is the form of their anterior extremity?

A. It terminates in a round ball or head, longer from above downwards.

Q. Does the metatarsal bone of the *great toe* differ from that of the rest?

A. Yes; its base is more hollowed and larger; its body thicker, stronger, and shorter; its anterior extremity is formed into a middle prominence, with two lateral depressions.

Q. Is there any thing particular in these *lateral depressions?*

A. Yes; a *sesamoid bone* plays in each of them, being placed between the tendon of the flexor muscle and the joint.

OF THE TOES.

Q. How many bones are in each toe?

A. *Three* in the small, and *two* in the great toe.

Q. How are they arranged?

A. Into phalanges, in the same manner as the fingers.

Q. How are their *bases* formed?

A. They are hollowed, forming sockets for receiving the heads of the *metatarsal* bones.

Q. Are the joints between the phalanges the same as in the fingers already described?

A. Yes; the proximate extremities of the second and third phalanges have a middle eminence, and two lateral depressions, and their distant extremities have a middle depression; and two lateral prominences; which, when applied to each other, form hinge-joints, termed ginglimus.

Q. What *motions* can the toes perform?

A. Flexion and extension only.

Q. Have the bodies of the phalanges *grooves* below?

A. Yes; in which the tendons of the flexor muscles run.

Q. Have all these articulations of the toes capsular ligaments?

A. Yes; they have not only capsular ligaments, but also strong lateral, and other ligaments, which connect them strongly together.

Q. What purposes does the arched construction of the foot serve?

A. It allows the tendons, muscles, blood-vessels, and nerves to lie, or pass along, free from pressure; it admits of a considerablo degree of elasticity, by which it facilitates walking, and in violent motions prevents concussion injurious to the tender viscera.

Q. What are the CHEMICAL CONSTITUENTS of bones?

A. *Calcareous earth*, *cartilage*, *gelatin*, and *oil*.

Q. What *chemical substances* does the *earthy part* contain?

A. Tho greatest part is *phosphate of lime*, a small portion of *carbonate of lime;* and a very minute portion of *sulphate of lime*.

Q. How can the earthy be separated from the animal matter?

A. By burning the bones to whiteness, the animal matter is dissipated; or, by immersing the bone in *muriatic acid*, its earthy part is dissolved and held in solu-

tion, while the *cartilage* remains, and keeps the bone of tho same figure, but flexible.

Q. How are the gelatin and oil separated?

A. By boiling the bones in water, the *oil* is collected on the surface; whilo tho *gelatin* is dissolved, and held in solution; and may bo obtained by cautious and proper evaporation on cooling.

SURGICAL ORGANIC DISEASES OF BONES.

Q. What diseases are the bones subject to?

A. The bones are exposed to external injuries, and may be bruised, broken, cut, or dislocated.

Q. Are they not subject to organic diseases also?

A. Yes; their organized structure is affected by various causes, and very considerably changed.

Q. Enumerate the ORGANIC DISEASES of bones?

A. The principal are Exostōsis, Caries, Abscess, Spina Ventosa, Gangrene, Exfoliation, Necrosis, an Excess of Earthy Matter, Rickets, Mollities, Fragilitas, Osteo-sarcoma, and Anchylosis.

Q. What is understood by EXOSTŌSIS?

A. It is a morbid enlargement of a bone, or a tumor growing upon it.

Q. Is *Exostosis* a constitutional, or local disease?

A. It is generally a local disease; but in some constitutions there seems to be a strong disposition to the formation of Exostōsis in a great number of bones.

Q. What bonos are most frequently seized with Exostosis?

A. The bones of the cranium, inferior maxilla, sternum, humerus, radius, ulna, carpal bones, the femur, tibia, and tarsal bones.

Q. Does *exostosis* grow outwardly, or inwardly?

A. It generally grows outwardly, but sometimes, though rarely, it grows inwardly, and makes compression upon the brain, the viscera of the thorax, or pelvis, and sometimes displaces the eye by growing into the orbit.

Q. What kinds of *exostosis* are generally met with?

A. Two; the *scrofulous* and the *venereal.*

Q. What bones does the *scrofulous exostosis* most frequently seize?

A. The bones of the spine, of the carpus and tarsus, and those of the hip and knee-joints; i. e. bones of a soft and spongy texture.

Q. What bones does the *venereal exostosis* most frequently seize?

A. Those of a firm compact texture, such as the middle of the humerus, tibia, fibula, ulna, os frontis, and ossa parietalia.

Q. What is the *internal structure of exostosis?*

A. It is very different, sometimes made up of a thin external plate, with numerous thin cross plates within, whose interstices are filled with cartilage; it sometimes consists of cartilage, fungous granulations, and pus; is sometimes composed of fibres closely compacted and hard.

Q. Which of these kinds grows the largest?

A. Those of a soft consistence, and containing fungous, and ill-conditioned pus.

Q. Are these denominated *Cancerous Exostoses?*

A. Yes, most frequently; because they degenerate speedily into Caries.

Q. Which kind of *exostosis* continues small and stationary?

A. That of a very compact hard texture like ivory.

Q. Do *venereal nodes* or *exostoses* degenerate into Caries?

A. Yes; always, if they be allowed to take their course, without being checked and discussed by medicine.

Q. When *Caries* supervenes upon *exostosis*, is the tumor removed?

A. The Caries generally wastes, and gradually destroys the tumour, which formed the exostosis.

Q. What is understood by Caries *of a bone?*

A. It is a gradual wasting of a part of the bone, which had previously been deprived of nourishment, and had died; *caries* of a bone, and *ulceration* of a soft part, are

very similar processes, carried on in parts of different textures.

Q. What bones are most subject to caries?

A. Those of a spongy soft texture, covered by a thin external lamella, such as, the bodies of the vertebrae, the extremities of the femur and tibia; the carpal and tarsal bones.

Q. Does caries of a bone produce purulent matter, like an ulcer?

A. Caries produces a fetid, ichorous, ill-conditioned matter.

Q. Is the skin discoloured above a caries bone?

A. Yes; it inflames and suppurates, and a fistulous opening is made to evacuate the matter generated below.

Q. What sensation to the finger does a carious part give when probed?

A. A rough, gritty sensation; or sometimes that of softness, when the parts are spongy.

Q. In what bones do ABSCESSES take place?

A. An Abscess most frequently happens in bones not much covered with thick muscles, such as the bones of the fore-arm, hand, leg, foot, cranium, and face.

Q. Where does the matter form?

A. In the medullary part of the bone, or where the cancelli are soft and spongy.

Q. What is the result of an abscess of a bone?

A. The matter formed irritates, inflames, and produces suppuration of the integuments, by which it finds an exit by fistulous openings.

Q. Is not this the same as SPINA VENTOSA?

A. When suppuration has taken place, and an ichorous matter is issuing from the fistulous orifices, the sharp cancelli standing out from the sides of the apertures, and the almost empty cavity of the bone, now suggested the name of *Spina Ventosa.*

Q. Is then *Spina Ventosa* to be considered the *sequēla* of suppuration, and abscess of a bone?

A. Yes, it properly is; but that name is frequently

given to the whole progress of disease in the part, both in a state of inflammation and suppuration.

Q. What is meant by GANGRENE of a bone?

A. When a bone, by any cause, has been deprived of nourishment, and becomes dead, of an ŏpaque white, brown, or blackish colour, it is said to be *gangrenous.*

Q. Does this *gangrene*, or *death*, affect the whole bone, or a part of it only?

A. It sometimes, in consequence of an injury, affects a part only, which, when dead, is cast off by exfoliation.

Q. What is the *process of* EXFOLIATION?

A. When the outer lamellæ of a bone have been deprived of their nourishment by the periostĕum being torn off and the bone bruised, they become gangrenous, or dead; the extremities of the arteries in the living bone nearest to the dead, throw out a fluid, similar to that produced by suppuration in other soft parts, between the dead and the living bones; and a separation of the dead is the consequence.

Q. What happens when the whole or greater part of a bone becomes gangrenous or dead?

A. The process is in effect the same as that of exfoliation, but to a much greater extent; the vessels of the living parts adjacent to, and surrounding the dead, throw out a purulent fluid, which cuts off all communication between the living and dead parts, and then secrete a gelatinous and cartilaginous fluid as a *nidus*, in which osseous particles are afterwards deposited in the formation of a new bone.

Q. What is this extensive process called?

A. It is denominated NECRŌSIS.

Q. By what name is the dead bone called in *necrosis*?

A. It is called the *sequestra.*

Q. What bones does Necrōsis most frequently attack?

A. The hard or middle parts of those slightly covered with muscular substance, such as, the inferior maxilla, clavicle, os humeri, tibia, and cranium.

Q. Does the new-formed osseous shell surround the sequestra?

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A. Yes; the new case is formed around the old dead bone.

Q. How then does the *sequestra* get out?

A. It generally produces irritation, inflammation, and suppuration of a surrounding part, and thus forms an opening for itself; or this process is facilitated by a Surgical Operation of making or enlarging the opening, and extracting the loose sequestra.

Q. Is the *sequestra* not absorbed?

A. Yes; in young people especially, it is frequently all absorbed; and in every case a considerable portion of its circumference is converted into a kind of pus, and absorbed.

Q. How can this *absorption* take place, if there be no communication between the living and dead parts, as you said before?

A. There is no vascular communication: the purulent matter constantly thrown out by the extreme vessels of the surrounding living parts, softens and dissolves the exterior of the sequestra; and as the absorbent vessels of the living surrounding parts are constantly at work, removing part of that purulent fluid, part of the sequestra is of course removed with it. This is the constant gradual process of absorption of bone.

Q. Is not the member, in which Necrosis is going on, larger than usual?

A. Yes; the new osseous shell being formed around the old bone, enlarges the bulk of the member, and makes it irregular on the surface, and ill-shaped.

Q. Do bones sometimes acquire a MORBID EXCESS OF EARTHY MATTER?

A. Yes: an unusual quantity of earthy matter is in some instances deposited either on the external surface, or in the internal structure of a bone: in consequence of which it acquires an unnatural size.

Q. What bones attain this *morbid size* most frequently?

A. Various bones are subject to this morbid increase of earth, particularly those of the cranium, the humerus, femur, and tibia.

Q. Is the *calcareous matter* deposited on the outer side of the bones of the cranium, or where?

A. It seems to be deposited between the two tables in the diplöe, and the bones in consequence become very much thickened; sometimes even to half an inch, or more.

Q. Where is it deposited in cylindrical bones?

A. Most frequently in the substance of the bone; its general size is much augmented; its medullary canal almost obliterated; and the cellular structure of its extremities filled with it. In some rare cases, an excrescence is attached to the outside of the bone, the cells of which are filled with matter resembling *soft cheese*, and a hard bony callus occupies the other parts.

Q. Has not the *earthy matter* of bones been sometimes converted into CHALK?

A. In people long afflicted with Gout, or perhaps Rheumatism, *chalk-like substances* are formed in the joints of the hands and feet; which are to be regarded as morbid concretions of this sort.

Q. Is a brittleness, or FRAGILITAS OSSIUM, owing to an increase of earthy matter?

A. *Fragilĭtas* is owing to an excess of earthy matter in proportion to the cartilaginous part of the bones, but it is not often attended with an increase of size.

Q. Is this *fragility* of bones owing to age?

A. It occurs most frequently in advanced age, when the bones attain a greater degree of solidity from an increase of earthy matter; and when their cartilaginous, gelatinous, and oleaginous parts are diminished.

Q. Does *fragility* of the bones ever follow disease?

A. Yes; the bones have been observed to become remarkably brittle in the latter stage of *Scorbūtus*, of *Cancer*, and of *Lues*.

Q. Is not a DEFICIENCY *of earthy matter* in bones a more frequent cause of disease?

A. Yes; much more frequent.

Q. What diseases are owing to a deficiency of the usual proportion of earthy matter?

A. Rickets, Mollities Ossium, and Osteo-Sarcoma.

Q. Are not all these varieties of the same disease?

A. They all denote a deficiency of earthy matter; but Rachĭtis is a disease of infancy; while Mollities is rather peculiar to advanced age, and is attended with much greater softness of the bones than the former.

Q. Does Rachĭtis affect all the bones, or one or two?

A. It commonly affects one, two, or more bones in a part, but sometimes, though more rarely, a great number.

Q. What bones are most frequently affected with Rickets?

A. The vertebrae of the spine; the ribs, and sternum; and the extremities of long bones.

Q. What *appearances* occur in a case of Rickets?

A. The bones become bent and flattened; when the ribs are affected, the thorax is narrow and protuberant at the sternum, compressed on the sides, the cartilages of the ribs becoming concave instead of their natural convexity.

Q. What is presented when the *vertebrae* are affected?

A. The spine becomes crooked in various places, and the head sinks, as it were, between the shoulders.

Q. What is the appearance when the *head* is affected?

A. The cranium seems preternaturally enlarged, and often mis-shapen.

Q. When Rickets affect the joints, what is their appearance?

A. They become enlarged in size, and mis-shapen.

Q. What happens when it affects the *long bones?*

A. They are bent in a direction opposite to their flexor muscles; thus the femur and tibia are bent forwards.

Q. When Rickets or Mollities affects the *bones of the pelvis*, what appears?

A. The *pelvis* becomes distorted, and diminished in capacity; the ossa innominata opposite to the acetabulum are pressed inwards, the pubis projects with its rami approaching closer together, and the promontory of the os sacrum often projects forward.

Q. Is the effect of MOLLITIES OSSIUM nearly the same as that of Rickets?

A. *Mollities* generally affects a greater number of bones; and seems in some cases to be constitutional, and to affect nearly the whole bones of the system.

Q. What is the *cause* of the *mollities ossium?*

A. It may be owing either to a deficiency of earthy matter, as has been said, or to an increased proportion of gelatinous and cartilaginous matter.

Q. How can the earthy matter become deficient?

A. It may be dissolved within the body by an excess of acid, and absorbed; as we dissolve the earthy matter of bones out of the body, and keep it in solution, by the *Muriatic Acid.*

Q. Is it the *Muriatic Acid* in excess, then, which dissolves the earthy part of the bones, and produces *mollities?*

A. It seems to be an acid, but whether the Muriatic or another, is uncertain.

Q. What is meant by OSTEO-SARCŌMA?

A. It is a softening and conversion of bone into a snbstance not unlike to *lard* or *fat:* or the external table of the bone includes a substance like fungous, instead of the cancellated internal structure.

Q. Is *Osteo-Sarcoma* a common disease?

A. No; it is fortunately very rare, and has been observed in a few cases to affect those, who in youth had been Rickety.

Q. What is understood by ANCHYLOSIS?

A. It is the accretion of the extremities of bones, and a stiffening of the joint.

Q. Is *anchylōsis* the effect of disease of the bones; or of the inter-articular cartilages?

A. It may be the effect of both.

Q. How does a disease of the articular cartilages produce *anchylosis?*

A. When these cartilages become inflamed, they throw out a quantity of coagulable lymph, which in the immoveable state of the limb produces adhesion of the inflamed surfaces of the cartilages tipping the extremi-

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ties of the bones forming the joint, and ultimately partial or total rigidity of the joint.

Q. What disease of the bones produces *anchylosis?*

A. In scrofulous constitutions, WHITE SWELLING of the knee sometimes destroys the cartilages, and softens the spongy extremities of the femur and tibia, and in some rare cases ultimately produces *anchylosis*. The *Morbus Coxarius* sometimes has the same termination.

Q. Is the destruction of the cartilages and the softness of the bones the cause of *anchylosis* in such cases?

A. Both must have taken place; but the *fibrin*, or *coagulable lymph* effused by the extreme arteries, is the direct cause of the accretion of parts, or of the *anchylosis*.

Q. Does *fibrin* abound in the blood of young people?

A. The blood of the young must contain a large proportion of the principles necessary for the growth of the individual parts of the system; and as fibrin is contained in those most essential to our existence and loco-motion, it must be derived from the blood.

Q. Do the bones of the young contain a greater proportion of cartilaginous and gelatinous matter than those of middle age?

A. Yes; gelatinous and cartilaginous matter is necessary for the tenacity and growth of the bones in young people. Hence they are more juicy, and much less apt to be fractured, than the bones of the adult of more advanced age; when the bones acquire a greater proportion of earthy matter, and become more brittle.

OF CARTILAGE.

Q. What is understood by *Cartilage?*

A. Cartilage is a white, elastic substance, nearest to bone in density; of a structure obscurely fibrous; and nearly a third lighter than bone.

Q. Are the *blood-vessels* of cartilages very conspicuous?

A. No; the vessels of cartilages are so small, that they do not admit the red particles of the blood, nor

the coloured injection of the Anatomist, except when osseous particles are just beginning to be deposited in them in the formation of bone.

Q. Can the *nerves* of cartilages be traced?

A. No; they are so small that they have never been traced in the compact dense substance of cartilage.

Q. Have cartilages much *sensibility?*

A. They have very little sensibility in their healthy state; their situation and office could not admit of great sensibility, without producing the greatest inconvenience and pain in the different motions of the body.

Q. How many *offices* do cartilages perform?

A. *Four;* they supply the place of bone; afford a nidus for the deposition of the earthy matter of bones; form articular surfaces; and perform the office of cartilages and ligaments at the same time.

Q. In what parts of the body does cartilage supply the *place of bone?*

A. In the nose, larynx, ends of the ribs, and on the brim of articular cavities making them deeper.

Q. In what parts does cartilage form a *nidus* for earthy matter?

A. In the long bones of infants and children, a great part of them towards the extremities is cartilage, in which earthy matter is deposited in the due confirmation of the bone.

Q. In what parts does it form *articular surfaces?*

A. In all the moveable joints cartilage covers the surfaces applied to each other, and by its smoothness and slipperiness facilitates their motions.

Q. In what parts does cartilage perform the *office of cartilage* and *ligament* at the same time?

A. Between the vertebrae of the spine, it gives all the elasticity of cartilage and the flexibility of ligament; and between the bones of the pelvis it is interposed, and fixes them together with all the firmness of ligaments.

Q. What ORGANIC DISEASES are *cartilages* subject to?

A. They sometimes become thinner, thicker, and softer; or harder than natural, and ossified.

Q. In what circumstances do *cartilages become thinner?*

A. When the trunk of the body is kept in nearly the same position for a great length of time, whether by certain occupations, or by reclining much in nearly the same posture, the inter-vertebral cartilages are compressed on one side, and eased on the other.

Q. What is *the effect* of that continued *posture* of the trunk?

A. The pressure on one side of the cartilages produces irritation there, and this in turn promotes the activity of the absorbents, by which, part, or the whole, of the cartilages of the compressed side becomes much thinner, or is wholly removed; while the removal of the usual pressure from the other side of the cartilage makes it increase in thickness and density. Hence a permanent curvature of the spine is the consequence.

Q. In what circumstances do the *cartilages become softer and thicker* than natural?

A. In scrofulous constitutions, the cartilages, which cover the articulating surfaces of bones, become painful, thickened, and spongy in their texture. This most frequently happens in the knee-joint, the hip-joint, the tarsus, and inter-vertebral substances.

Q. Do this softness and thickening not happen to bones themselves?

A. The cartilaginous part of bones undergoes the same change in many instances. Hence the extremities of the femur and tibia, also part of the bodies of the vertebrae; and the bones of the tarsus, or carpus, have been softened, thickened, ulcerated, and sometimes absorbed.

Q. In what circumstances are *cartilages converted into bone?*

A. When the vessels in the cartilages are moderately irritated, they deposite osseous particles, which sometimes happens in diseased joints, and *Anchylosis* is the consequence: or, in advanced age, when the lubricating

fluid is too scanty, irritation of the articular surfaces and ossification takes place.

Q. What parts are most frequently ossified?

A. The cartilages of the ribs, inter-vertebral cartilages, and those tipping the ends of bones in the joints: sometimes loose cartilaginous bodies have been found in the knee-joint.

OF LIGAMENTS.

Q. What is understood by ligament?

A. *Ligament* is a strong, whitish, flexible substance, composed of longitudinal and obliquely transverse fibres.

Q. Have *ligaments* distinct *blood-vessels?*

A. Yes; they are supplied with numerous blood-vessels, which can readily be filled in with coloured injection by the Anatomist.

Q. Have *ligaments nerves* large enough to be traced?

A. The nerves of ligaments are very minute, but they can be traced upon their surface in some parts of the body.

Q. Have ligaments much *sensibility?*

A. Their sensibility, like that of cartilage, in the sound state, is very inconsiderable; but when inflamed, they become extremely sensible, as the acute pain in *Rheumatism*, *Gout*, and *White swelling*, clearly shews.

Q. What *offices* do ligaments perform?

A. They in many instances form bags, which include the joints, and are then called *capsular* ligaments; others are so fixed to the ends of the articulating bones as to confine the motions of the joint; others supply the place of bones, as in the pelvis, and between the radius and ulna, giving origin to muscles; and others fix the bones almost immoveably together.

Q. What is the *structure of capsular ligaments?*

A. The outer part of them is formed by a continuation of the periosteum, which is connected with the surrounding parts by cellular substance; the inner layer of the capsule being thin and dense, is reflected over

the cartilages, which tip the ends of the articulating bones.

Q. What lubricates the articulations, and facilitates their motions?

A. A mucilaginous fluid, called SYNOVIA, secreted by the vessels of the internal surface of the capsular ligaments; and also by organs placed in some joints for the purpose.

Q. What are these organs?

A. The *synovial organs*, or *glands*, are composed of little masses of fat covered by a continuation of the inner layer of the capsule, and projecting so as to be gently moved or pressed in the motions of the joint.

Q. Are they really *glands?*

A. They are generally considered glands, because they secrete a fluid; although, on minute inspection, no glandular apparatus can be discovered in their structure.

Q. What is their colour and appearance?

A. They are whitish, and sometimes from the number of their blood-vessels they are reddish; from their margin fimbriae hang loose, and transmit the synovial liquor into the joint.

Q. What is the *nature of the synovia?*

A. It is of a yellow hue, like olive oil; is of the consistence of the albumen ovi, froths when agitated; is smooth, viscid, and slippery to the touch.

Q. Does the quantity of synovia secreted vary at different times?

A. Its quantity varies very much, and seems to depend on the motions of the joint; for, when the joint is at rest it is not required, but when exercised, its motions stimulate the synovial organs to pour out a quantity of their fluid sufficient to moisten and lubricate the whole articulating surfaces of the joint.

Q. What are the *chemical properties* of synovia?

A. The quantity that can be procured of human synovia being too small to furnish a suite of experiments in order to establish its properties, that of the ox has been had recourse to, and contains a peculiar matter,

albumen, gelatin, mucilage, soda, muriate of soda, and phosphate of lime.

OF THE LIGAMENTS OF THE HEAD, AND TRUNK.

Q. How many *ligaments* are proper to the INFERIOR MAXILLA?

A. Three on each side, the capsular, suspensory, and lateral.

Q. What are the attachments of the *capsular ligament* of the *inferior maxilla?*

A. It *arises* from the whole margin of the glenoid cavity of the temporal bone; and is *inserted* into the edge of the inter-articular cartilage, and round the cervix of the maxilla.

Q. What are the attachments of the *suspensory ligament?*

A. It *arises* from the *styloid process* and from a *ligament* passing across from the same process to the os hyoides; and is *inserted* into the *angle* of the inferior maxilla.

Q. What is the use of it?

A. The *suspensory* ligament supports the stylo-glossus muscle, and gives origin to part of it.

Q. What are the attachments of the *lateral ligament?*

A. It *arises* from the margin of the glenoid cavity, and is *inserted* into the inner side of the angle near the foramen maxillare posterius.

Q. What is the *use* of this *lateral ligament?*

A. It keeps the condyle in situ, and defends the blood-vessels and nerve entering the foramen, from the pressure of the internal pterygoid muscle during its action.

Q. How many *ligaments* attach the HEAD TO THE VERTEBRAE of the neck?

A. *Four* properly, viz. the two capsular, circular, and perpendicular; and other two assist, namely, the two lateral or moderator ligaments.

Q. Describe the attachments of the *capsular ligaments* of the head?

A. They *arise* from the margin of the superior articular processes of the Atlas, and are *inserted* into the base of the condyles of the os occipitis.

Q. What are the attachments of the *circular ligament?*

A. It *arises* from the margin of the large spinal foramen of the atlas, is connected with the capsular ligaments, and is *inserted* into the edge of the foramen magnum.

Q. What are the attachments of the *perpendicular ligament?*

A. It *arises* from the point of the processus dentatus, and is *inserted* into the anterior part of the margin of the foramen magnum.

Q. What are the attachments of the two *lateral ligaments*, which assist those proper to the head?

A. They *arise* from the sides of the processus dentatus, ascend laterally, and are *inserted* into the inner part of the side of the atlas, and to the internal edge of the foramen magnum before the condyles.

Q. What is the *use* of these two strong short *lateral ligaments?*

A. They moderate the rotatory motions of the head, and prevent it from being turned too far.

Q. What ligaments secure the *processus dentatus* in situ?

A. The perpendicular, and two lateral ligaments just mentioned; and especially the transverse ligament.

Q. What are the attachments of the *transverse ligament?*

A. It *arises* from the inner sides of the anterior part of the atlas, and running across behind the processus dentatus in a circular groove, is *inserted* into the opposite side.

Q. Is there any other ligament connecting the head to the cervical vertebrae?

A. Yes; the *ligamentum nuchae* vel *colli.*

Q. What are its attachments?

A. The *ligamentum nuchae arises* from the perpendicular spine of the occipital bone, and descending is *inserted* into the spinous processes of the cervical vertebrae.

Q. How many *ligaments* are common to all the VERTEBRAE?

A. *Two;* the anterior and posterior common ligaments.

Q. Describe the *common anterior ligament of the vertebrae?*

A. It is a tendinous ligament beginning round and small at the atlas, and gradually becoming broader as it descends to the os sacrum; it covers the convex anterior part of the bodies of the vertebrae, being much thicker and stronger on the fore part than on the sides.

Q. What is the *use* of this anterior common ligament?

A. It is thinner above and below near the under part of the os sacrum, is firmly connected to the bodies and periosteum of the vertebrae, binds them firmly together, and prevents the spine from being too much bent backwards.

Q. Describe the *common posterior ligament* of the vertebrae?

A. It begins at the anterior part of the foramen magnum, descends on the inner concave part of the bodies of the vertebrae, becoming broader over the inter-vertebral substances, and adhering firmly to them, terminates at the lower part of the os sacrum.

Q. What is the *use* of this posterior common ligament?

A. It binds the vertebrae strongly together, and prevents the spine from being too much bent forwards.

Q. How many *ligaments* have the *vertebrae in general?*

A. The *inter-vertebral substance*, and *seven ligaments*, viz. the crucial, inter-spinous, inter-transverse, and capsular ligaments.

Q. Describe the *inter-vertebral substance?*

A. It is a cartilago-ligamentous substance composed

of concentric lamellae, whose edges are firmly fixed to the bodies of the vertebrae; and it is very elastic.

Q. What are the *uses* of the inter-vertebral substances?

A. These substances fix the bodies of the vertebrae together, diminish the effect of concussion, and allow the spine to bend in all directions.

Q. Describe the situation of the *crucial* or *inter-vertebral ligaments?*

A. These two are composed of numerous strong, short fibres, which, situated behind the anterior common ligament, cross each other obliquely in passing from the edge of one vertebra to that of another.

Q. What are their *uses?*

A. The *crucial ligaments* fix the bodies of the vertebrae together, and adhere to the inter-vertebral substance.

Q. What are the situation and use of the *inter-spinous ligaments?*

A. They pass from the edge of the arch and spinous process of one vertebra to those of another, and connect them together.

Q. What are the situation and use of the *inter-transverse ligaments?*

A. They are attached to the transverse processes, and connect them firmly together.

Q. Describe the capsular ligaments?

A. They are two between every two vertebrae, attached to the margin of the articular oblique processes, fixing them together so as to admit of their proper movements.

Q. How many *ligaments* attach the RIBS *to the vertebrae?*

A. *Five;* the capsular ligament of the head, and of the tubercle, the external and internal transverse, and the external ligament of the neck of the rib.

Q. What are the attachments of the *capsular ligament of the head of the ribs?*

A. It *arises* from the spongy margin of the articullating surface on the head of the rib, and is *inserted* into

the circumference of the cavity in the vertebrae and their inter-vertebral substance.

Q. Describe the attachments of the *capsular ligament of the tubercles?*

A. The back part of the tubercle is applied to the fore part of the transverse process, and firmly attached by the capsular ligament, which *arises* from the margin of the articular surface near the end of the transverse process, and is *inserted* round the base of the tubercle.

Q. Describe the situation and attachments of the *internal and external transverse ligaments?*

A. The *internal* arises from the inferior surface of the transverse process, and is *inserted* into the upper margin of the neck of the nearest rib: the *external* arises from the point of the transverse process, and is *inserted* into the back of the neck.

Q. Describe the *external ligament of the neck* of the ribs?

A. This ligament *arises* from the external side of the inferior oblique process, and descending obliquely outwards, is *inserted* into the upper and outer part of the neck of the ribs.

Q. What *motions* are these ligaments calculated to allow?

A. They admit of motions upwards and downwards only.

Q. What ligaments connect the *ribs to the* STERNUM?

A. The capsular, and radiated or transverse ligaments.

Q. Describe the attachments of the *capsular ligaments* of the ribs *with the sternum?*

A. The *capsular* ligament of the cartilage of the seven true ribs *arises* from the margin of the articular cavity in the side of the sternum, and is *inserted* round the extremity of the cartilage.

Q. What are the attachments of the *radiated* or *transverse ligaments?*

A. They *arise* from the sternum, and run over the

capsular ligaments, and are *inserted* into the cartilages of the ribs.

Q. Are there not *other ligaments* connected with the ribs?

A. Yes; the union of the rib and its cartilage is secured by a covering of ligamentous fibres; and near the sternum a tendinous expansion of fibres connects the cartilages together.

Q. What *ligaments* has the *sternum* peculiar to itself?

A. A very firm tendinous expansion covers the whole sternum internally and externally.

Q. What ligaments has the *ensiform cartilage*?

A. It has various ligamentous bands from the covering of the sternum, and from the cartilages of the seventh pair of ribs.

Q. How are the *ligaments of the* PELVIS divided?

A. Into those which unite the bones; and into those on the anterior, and those on the posterior aspect of the pelvis.

Q. What ligaments fix the bones of the pelvis together?

A. The uneven articulating surfaces of the ossa innominata and each side of the os sacrum are covered with *cartilage*, which, intervening between the bones, fixes them so very firmly together as to admit of no motion.

Q. Is the *symphysis pubis* joined in the same manner?

A. Yes; exactly in the same manner, and admits of no motion.

Q. Have these joinings of the bones of the pelvis any other ligaments?

A. They have each a *capsular ligament*, which covers and strengthens the articulation.

Q. Do *these articulations* relax, and *open* a little at the symphysis pubis *during parturition?*

A. It was long thought so, but it is a mistake; for these articulations of the pelvis never admit of the smallest motion even in parturition without a disease,

which renders the woman incapable of walking for a long time.

Q. What ligaments are situated on the *fore part* of the pelvis?

A. The inguinal, and obturator membrane or ligament.

Q. Describe the *inguinal ligament?*

A. This ligament, called also POUPART'S FALLOPIUS' *ligament*, and *crural arch*, is considered by some as part of the tendon of the external oblique muscle; it *arises* from the anterior superior spinous process of the ilium, runs transversely, and is *inserted* into the crest of the os pubis.

Q. Describe the *obturator ligament?*

A. It is a strong membranous ligament, which is attached to the margin of the *foramen thyroidēum*, and closes up the whole of the foramen, except an oval notch at its superior part for the passage of the *obturator artery*, *vein*, and *nerve*.

Q. What ligaments are situated in the *posterior part* of the pelvis?

A. The two transverse, the ilio-sacral, the long and the short sacro-ischiatic, and other slips, on either side.

Q. What are the attachments of the two *transverse ligaments?*

A. They *arise* from the spine of the os ilium, run transversely, and are *inserted*, the *superior* into the last lumbar vertebra, the *inferior* into the first transverse process of the os sacrum.

Q. Describe the attachments of the *ilio-sacral ligaments?*

A. They *arise* from the posterior spinous process of the os ilium, descend obliquely, and are *inserted* into the first, third, and fourth transverse processes of the os sacrum.

Q. Describe the attachments of the *long* and *short sacro-sciatic* or *ischiatic ligaments?*

A. They *arise* in common from the transverse processes, from the under and lateral part of the os sacrum, and from the upper part of the os coccygis; the *long*

one is *inserted* into the tuberosity of the os ischium; and the *short one* running transversely, is *inserted* into the spinous process of the os ischium.

Q. What are the *uses* of these *sacro-sciatic ligaments?*

Q. They bind the bones together, support the contents of the pelvis, and give origin to muscles. The long or external one forms the notch of the ilium into a large foramen, through which the *pyriform muscle*, *sciatic-blood vessels*, and *nerve*, pass out; between the two a hole is formed, through which the *obturator internus* muscle passes out of the pelvis.

Q. Where are the *ligamenta vaga* dispersed?

A. They are numerous slips running in various directions between the os sacrum and ossa ilia.

Q. What *ligaments* are attached to the *os coccygis?*

A. It has a *capsular ligament*, where it is articulated with the os sacrum, and a *general ligamentous expansion* descending from the sacrum covers the whole of it.

OF THE LIGAMENTS OF THE SUPERIOR EXTREMITIES.

Q. By what ligaments is the CLAVICLE *bound to the sternum?*

A. By the inter-articular cartilage, the capsular, radiated, inter-clavicular, and rhomboid ligaments.

Q. What is the *use of the inter-articular cartilage?*

A. It covers the articulating surfaces of the sternum and clavicle, accommodates them to each other, and adapts them for easy motion.

Q. What are the attachments of the *capsular ligament?*

A. It *arises* from the thick upper corner of the sternum around the articular cavity, incloses the inter-articular cartilage, and is *inserted* around the head of the clavicle.

Q. What are the attachments of the *radiated* ligament?

A. This ligament on either side *arises* from the ex-

ternal surface of the sternal end of the clavicle, and is *inserted* into the sternum around the capsular ligament.

Q. What are the attachments of the *inter-clavicular* ligament?

A. It is extended from the elongated angle of the extremity of the one clavicle to that of the other behind the top of the sternum, and fixes them strongly together.

Q. Describe the attachments of the *rhomboid* ligament?

A. It *arises* from the rough inferior surface of the clavicle on each side, and is *inserted* into the first rib at its sternal articulation.

Q. What ligaments *fix the clavicle to the* SCAPULA?

A. The capsular, conoid, and trapezoid ligaments.

Q. What is the situation of the *capsular* ligament?

A. The *scapular end* of the clavicle, and also the articular surface of the *acromion* process, are covered generally with inter-articular cartilage, and firmly fixed together by this and the capsular ligament, which closely surrounds the articulation, and is attached to both bones.

Q. What are the attachments of the *ligamentum conoidēum?*

A. It *arises* from the root of the coracoid process, and is *inserted* into the tubercle of the clavicle.

Q. What are the attachments of the *ligamentum trapezoidēum?*

A. It *arises* from the point of the corăcoid process, and is inserted into the under edge of the clavicle near the tubercle.

Q. What *ligaments are proper to the* SCAPULA?

A. The anterior and posterior ligaments.

Q. What are the attachments of the *anterior ligament of the scapula?*

A. It is of a triangular form, *arises* broad from the external surface of the coracoid process, and becoming narrower, is *inserted* into the posterior and upper edge of the acromion.

Q. What *use* does *this anterior* ligament serve?

A. It binds down the tendon of the supra-spinatus, protects and secures the upper and inner part of the shoulder joint.

Q. What is the situation of the *posterior ligament* of the scapula?

A. It is stretched across the *semi-lunar notch*, forming it into a hole for the passage of the superior-posterior *blood-vessels* and *nerve*.

Q. What ligaments *connect the* SCAPULA *and* HUMERUS?

A. The capsular ligament, and the tendon of the long head of the biceps flexor cubiti.

Q. Describe the attachments of the *capsular ligament* of the shoulder joint?

A. It *arises* from the cervix of the scapula near the margin of the glenoid cavity, and is *inserted* round the neck of the os humeri; forms a sheath on its fore part for keeping the tendon of the biceps in situ.

Q. Describe the *tendon of the biceps*, and how it contributes to the security of the joint?

A. This tendon *arises* from the upper edge of the glenoid cavity, passes over the ball of the humerus within the joint, and, being inclosed in its sheath, gives great security to the shoulder joint, against accidents forcing the head of the humerus upwards.

Q. What ligaments bind the OS HUMERI TO THE RADIUS AND ULNA?

A. The capsular, the humero-cubital, humero-radial, and the two inter-muscular ligaments.

Q. Describe the attachments of the *capsular ligament of the elbow-joint?*

A. It *arises* from the margin of the articular surface of the humerus, and is *inserted* into the edge of that of the ulna, and into the coronary ligament of the radius.

Q. What are the attachments of the *humero-cubital* ligament?

A. It, called also *internal lateral*, *arises* from the anterior part of the inner condyle of the os humeri, spreads in a radiated manner, and is *inserted* into the inner side of the coronoid process of the ulna.

Q. What are the attachments of the *humero-radial?*

A. It, called also *external lateral, arises* from the external condyle, and is expanded upon, and *inserted* into the coronary ligament of the radius.

Q. Describe the *inter-muscular ligaments,* and their use?

A. They *arise,* the one from the external, and the other from the internal condyle, and are *inserted* into the sides of the humerus: they are destined to give origin to muscles.

Q. Describe the attachments of the *coronary* or *annular* ligament of the radius?

A. It *arises* from the one side of the semilunar cavity of the ulna and capsular ligament, and is *inserted* into the other side, and also around the neck of the radius.

Q. What is the *use* of the coronary ligament of the radius?

A. It binds the head of the radius to the ulna, and allows it to move easily round its own axis, as well as upon the articular service of the ulna, in flexion and extension of the elbow-joint.

Q. What other ligaments *connect the radius and ulna?*

A. The interosseous, oblique, and capsular or sacciform ligaments.

Q. Describe the attachments of the *interosseous ligament?*

A. It extends between the acute ridges of the radius and ulna, and fills up the intermediate space.

Q. Are there any *holes* in it?

A. Yes; a large opening at its upper part for muscles passing; and a few small perforations for blood-vessels passing from its anterior to the posterior side.

Q. What is the *use of the interosseous ligament?*

A. It binds the radius and ulna together, limits the motion of supination, and affords attachment to muscles.

Q. What is the situation of the *oblique ligament?*

A. Some consider this a part of the interosseous ligament; it *arises* from the tubercle at the base of the coro-

noid process of the ulna, and is *inserted* into the under part of the tubercle of the radius.

Q. Describe the *capsular* or *sacciform* ligament?

A. It *arises* from the edges of the semilunar cavity at the carpal extremity of the radius, surrounds the head of the ulna, and fixes it in situ, while it admits of their movement partially round each other in pronation and supination of the hand.

Q. What ligaments connect the RADIUS AND ULNA TO THE CARPUS?

A. The capsular, the external and internal lateral ligaments, and the inter-articular cartilage.

Q. Describe the attachments of the *capsular ligament of the wrist?*

A. It *arises* from the margin of the *navicular cavity* of the radius, to the moveable cartilage at the head of the ulna, and is *inserted* into the cartilaginous edges of the os scaphoides, lunare, and cuneiforme of the carpus.

Q. Describe the attachments of the *lateral ligaments of the wrist?*

A. The *external* arises from the styloid process of the radius, and is inserted into the os scaphoides; the *internal* from the styloid process of the ulna, and is inserted into the cuneiform and pisiform bones.

Q. Describe the *inter-articular cartilage* of the ulna?

A. It is placed between the head of the ulna and the os cuneiforme, seems a continuation of the cartilage, which covers the end of the radius; it is loosely attached to the end of the styloid process.

Q. What are the LIGAMENTS OF THE CARPUS?

A. The annular and capsular ligaments.

Q. Describe the *annular ligament?*

A. It is frequently divided into an anterior and a posterior portion; it is fixed to the projections of the pisiform and cuneiform bones, stretches across, and adheres to the os scaphoides, and trapezium, embracing the tendons of the muscles.

Q. Does the annular ligament not form *sheaths* for the tendons of muscles?

A. Yes; the anterior portion of it, called *ligamentum carpi annulare anterius*, not only binds down the different tendons of the flexors of the wrist and fingers, but forms separate sheaths for them.

Q. Does the *posterior portion* do the same?

A. Yes; the *ligamentum carpi annulare posterius*, binds down the different tendons of the extensor muscles, and also forms distinct sheaths for them to play in.

Q. Describe the *capsular ligament of the carpal bones?*

A. It arises from the cartilaginous edge of the first row, and is inserted into that of the second row.

Q. Are there other ligaments of the carpus?

A. There are various ligamentous slips, running in different directions, binding the carpal bones firmly together.

Q. What ligaments connect the CARPAL TO THE METACARPAL BONES?

A. *Capsular* or *articular ligaments* surround the different articulations, and bind the respective bones together; as their fibres are stronger on the sides, behind and before, they have been termed lateral, dorsal, and palmar ligaments.

Q. What ligaments connect the *metacarpal bones together?*

A. They have *interosseous ligaments*, which run in various directions.

Q. What ligaments have the *articulations of the* PHALANGES of the fingers?

A. Each joint has a *capsular*, and *two lateral* ligaments for strengthening the sides of the capsular, to which they adhere.

Q. What retains the tendons of the flexors of the fingers in situ?

A. *Viginal* or *crucial* ligaments pass across them from one ridge to the other on the sides of the grooves in the concave or volar side of the phalanges.

OF THE LIGAMENTS OF THE INFERIOR EXTREMITIES.

Q. What ligaments connect the os FEMORIS *with the* OS INNOMINATUM?

A. The round and capsular ligaments.

Q. What are the attachments of the *internal* or *round ligament?*

A. It *arises* broad and flat from the under and inner part of the cavity of the acetabulum, runs backwards and upwards, becoming rounder, and is *inserted* into the pit on the inner surface of the head of the femur.

Q. What is the *use* of it?

A. The *internal* or *round ligament* retains the ball of the os femoris in the acetabulum, and materially assists in preventing dislocation of the joint from accidents forcing it upwards or inwards.

Q. Describe the attachments of the *capsular ligament* of the os femoris?

A. This capsular ligament is very thick and strong; it *arises* from the outside of the brim of the acetabulum, incloses the head, and is *inserted* round the root of the neck of the femur; its outer part descends farther than its inner, a layer of which is reflected up to the margin of the head, and transverse slips connect them.

Q. Is this *capsular ligament* of the *hip-joint* not strengthened also by various other means?

A. Yes; various ligamentous slips lie on its surface, sent off from the fascia lata, and inferior anterior spinous process of the os ilium; it is strengthened also by surrounding muscles, particularly the iliacus internus, and quadratus.

Q. What *means* are *used to deepen* the cavity of the acetabulum?

A. There is a *cartilage*, thick and strong, surrounding the osseous brim, and rising to a considerable degree, which deepens the cavity and renders the articulation more secure.

Q. Is there a *gland* in this articulation?

A. Yes; a gland is lodged in a depression at the under and inner part of the acetabulum, for the purpose of lubricating the joint.

Q. Is this *glandular apparatus* peculiar to this hip-joint?

A. No; a similar apparatus is found in all the large joints; thus, a *fimbriated organ* is placed within the capsular ligament of the *shoulder-joint* for the secretion of a lubricating fluid; and a *fatty substance* within that of the *elbow-joint* for a similar purpose.

Q. What ligaments attach the OS FEMORIS TO THE TIBIA AND FIBULA?

A. The two lateral, the popliteal, that of the patella, the capsular, and crucial ligaments.

Q. Describe the attachments of the *two lateral ligaments?*

A. The *internal lateral*, of considerable breadth and strength, arises from the upper part of the internal condyle of the femur, and is inserted into the upper and inner part of the tibia; the *external lateral*, longer and stronger, arises from the tubercle of the external condyle, and is inserted into the fibula below its head.

Q. Describe the *popliteal ligament?*

A. It, sometimes called the *posterior of* WINSLOW, arises from the upper and posterior part of the external condyle, descends obliquely over the capsular ligament, and is inserted into the inner and back part of the tibia.

Q. What is the *use* of it?

A. It prevents the leg from being stretched too far forwards, and affords origin to part of the gastrocnemius and plantaris muscles.

Q. Describe the *ligament of the patella?*

A. It arises from a depression of the patella, descends, and is inserted into the tuberosity of the tibia; it is strengthened by the tendinous expansion of the muscles of the thigh.

Q. What are the attachments of the *capsular ligament of the knee-joint?*

A. It arises from the circumference of the articular surface of the femur, and above the large notch behind,

and is inserted into the margin of the articular surface of the tibia, and into that of the patella, which forms a part of the capsule itself.

Q. Is this *capsular* ligament of the *knee-joint* strengthened by any other means?

A. It is covered on different parts by the *ligaments* already described, by the *aponeurosis* of the thigh, and also by the *tendons* of various muscles.

Q. Does it not form processes at the sides of the patella?

A. It seems folded there, and forms the *ligamenta alaria*, which are merely parts of the capsule.

Q. Has the *Knee-joint* any *glandular apparatus*?

A. It has the largest apparatus of any of the joints, situated chiefly round the patella, and in other parts of the joint also.

Q. Describe the *crucial ligaments*?

A. The *anterior* arises from the outer part of the rough notch between the condyles, descends forwards, and is inserted into a pit before the rough protuberance in the middle of the articular surface of the tibia: the *posterior* arises from the inner side of the notch, and is inserted into a pit behind the protuberance of the tibia; they decussate each other.

Q. What are the *uses of the crucial*, or internal ligaments of the knee-joint?

A. They are situated within the capsular ligament, bind the bones firmly together, prevent the leg from being too far extended, and admit of a little rotation of the toes outwards in the bent state of the knee, but prevent rotation inwards.

Q. Are any *cartilages* situated in the knee-joint?

A. The two *inter-articular cartilages* are placed on the upper surfaces of the tibia.

Q. Describe these *inter-articular cartilages?*

A. They are also called *semilunar* from their shape, their circumference is thick, while their inner concave edge is thin like a sickle, their cornua are joined, and their convex thick surface adhere to the capsular ligament.

Q. What is the *use* of these two *semilunar cartilages* in each knee-joint?

A. They deepen the cavities on the top of the tibia, and adapt them better to the condyles of the femur, by which they give greater security to the joint.

Q. What *ligaments* bind the FIBULA TO THE TIBIA?

A. The capsular above, the interosseous in the middle, and the transverse ligaments below.

Q. What are the attachments of the *capsular ligament of the fibula?*

A. It is attached round the articulating surface of the two bones, and is much strengthened by the external lateral ligament of the knee, and the tendon of the biceps.

Q. What are the attachments of the *interosseous ligament?*

A. It is attached to the posterior and outer ridge of the tibia, extends across to the inner ridge of the fibula, and fills up the intermediate space between the bones.

Q. Are any *holes* in it?

A. There is a large opening above occupied by muscles, and some small holes lower down, through which *bloodvessels* and *nerves* pass.

Q. What is the *use* of this *interosseous ligament?*

A. It binds the bones together, and affords origin to muscles.

Q. What are the attachments of the *transverse ligaments* of the fibula?

A. The *anterior* arises from the anterior edge of the semilunar cavity of the tibia; the *posterior* from its posterior edge, and they are both firmly inserted into the end of the fibula, which forms the *malleolus externus.*

Q. What ligaments connect the ends of the TIBIA and FIBULA TO THE BONES OF THE TARSUS?

A. The anterior, posterior, and middle ligaments of the fibula, the deltoid of the tibia, and the capsular ligament.

Q. What are the attachments of the *anterior ligament of the fibula?*

A. It *arises* from the fore part of the malleolus exter

nus, and passing obliquely forwards, is *inserted* into the upper and outer part of the *astragălus*.

Q. What are the attachments of the *posterior ligament of the fibula?*

A. It *arises* from the under and back part of the malleŏlus externus, and running backwards, is *inserted* into the outer and posterior part of the *astragălus?*

Q. What are the attachments of the *middle* or *perpendicular ligament of the fibula?*

A. It *arises* from the point of the malleolus externus, and descending almost perpendicularly is *inserted* into the outside of the os calcis.

Q. Describe the *ligamentum deltoides of the tibia?*

A. It *arises* from the malleolus internus, and descending in a radiated manner is *inserted* into the astragalus, os calcis, and os naviculare.

Q. What are the attachments of the *capsular ligament of the tarsus?*

A. The capsular ligament lying within those just mentioned, *arises* from the margin of the articular cavity of the tibia and fibula, and is *inserted* round that of the astragalus.

Q. What *motions* does the *ankle-joint* perform?

A. Motions of flexion and extension only. This joint is so firmly secured by the projections of the tibia and fibula, and by the different strong ligaments, that one of the malleoli must be fractured before it can be dislocated.

Q. What *ligaments* have the BONES OF THE TARSUS?

A. They have articulating cartilages between them, and capsular ligaments round every articulation; and besides, they are bound together most firmly by ligaments passing across from bone to bone, in a variety of directions.

Q. Mention the most conspicuous of these?

A. The *capsular* ligament, which surrounds the articulation *of the os calcis and astragalus;* the *capsule of the astragalus* and *os naviculare*, which admits of the lateral and rotatory motions of the foot; the *inter-*

nal ligament passing between the under part of the os calcis and os naviculare for supporting the astragalus.

Q. What *ligaments* connect the TARSAL AND METATARSAL BONES?

A. *Capsular* ligaments around their articulations, strengthened by dorsal, plantar, lateral, oblique or transverse, as their fibres are directed.

Q. What ligaments connect the *metatarsal bones* together?

A. The dorsal or transverse, plantar and lateral ligaments.

Q. What ligaments connect the *phalanges of the toes* together?

A. The capsular and lateral ligaments.

Q. What ligaments retain the *tendons* of the muscles of the foot and toes in situ?

A. The *annular* ligament of the tarsus, formed by the aponeurosis. It forms also sheaths for the tendons in playing round the ankles, and the plantar aponeurosis forms other sheaths in the sole.

OF SURGICAL ORGANIC DISEASES OF LIGAMENTS.

Q. What *organic derangements* are ligaments subject to?

A. Ligaments are ruptured, inflamed, thickened, relaxed, reduced to a thickened and spongy state, ossified, and give rise to morbid cartilaginous bodies.

Q. In what circumstances are *ligaments lacerated and ruptured?*

A. In *cases of luxation;* where some ligaments are always overstretched, lacerated, and ruptured, which is the cause of the acute pain.

Q. From what causes do they become *inflamed?*

A. Ligaments may become inflamed from various causes, such as, injuries, Gout, Rheumatism, and White Swelling.

Q. What are the *effects of inflammation* of ligaments?

A. It renders the ligaments extremely sensible and

P 2

painful; and in the progress of disease they become often much thickened and rigid; and sometimes suppurate.

Q. In what diseases are the ligaments reduced to a *thickened and spongy state?*

A. In Scrofulous diseases of the joints, the ligaments, as well as the cartilages covering the articular surfaces, become soft, spongy, and thick; and are sometimes dissolved into an ill-conditioned pus.

Q. In what disease do the ligaments become *unusually relaxed?*

A. In some rare cases of general, or topical debility, the capsular ligament becomes so preternaturally relaxed and elongated, as to allow the head of the articulating bone to remove from its socket, and to produce a temporary and spontaneous luxation.

Q. Is the *conversion of ligament into bone* a frequent occurrence?

A. It is pretty frequent, especially if the ligament partakes of a cartilaginous nature. It is more frequent too in advanced age.

Q. Are *cartilaginous bodies* frequently attached to ligaments?

A. Sometimes, though rarely, they grow from ligaments; or are formed between the external layers of their substance, and are called *tophi.*

Q. What seems to be the *cause of the growth* of these bodies?

A. They seem to arise from some strain or overstretching, or from a bruise of the ligament of the part; in which an effusion takes place, which is gradually consolidated and converted into cartilage.

OF MYOLOGY.

Q. What is understood by a MUSCLE?

A. It is a fleshy substance, composed of fibres susceptible of contraction and relaxation.

Q. What parts does a muscle consist of?

A. Of an origin, a belly, and an insertion or termination.

Q. How is the origin known from the insertion?

A. The extremity attached to the most fixed part, to which the contraction is made, is called the origin of the muscle.

Q. What is meant by the belly?

A. It is that thickest part, which in action swells and enlarges.

Q. What connects the fibres of the muscles together?

A. Cellular substance.

Q. What forms the tendons of muscles?

A. The cellular substance condensed into a tendinous expansion gives attachment often to the oblique fibres in the course of the muscle, and at the extremity, generally becomes stronger and rounder.

Q. What purposes do the tendons of muscles serve?

A. They occupy less space while passing over joints to their termination, and preserve the symmetry of the parts, and are not easily fatigued with continued action.

Q. Does the tendinous expansion answer any other purpose besides giving attachment to muscular fibres?

A. It also sometimes covers the muscles, binds them in their situation, and in certain parts keeps their tendons from starting out of their places.

Q. Are tendons to be considered different from muscles, although they form a part of them?

A. Yes; the fibrous and fleshy part of muscles is that capable of contraction and relaxation; while the white, glistening, tendinous part of them having very little sensibility, and no contractibility, is disposed in layers, or chords in their substance, in order to afford attachment to the fibres, and towards their termination it becomes firmer and stronger for sustaining the whole power of the fibrous part.

Q. Can the fibrous part of a muscle then not act without a tendinous part?

A. Yes; when the distance is small between the origin and termination of muscles, they have no tendons; but when the distance is great, their fibres are generally disposed obliquely, and are attached to one or more ten-

dinous chords, or fasciae, to which they contract as to a fixed point.

Q. Have muscular fibres a large supply of blood and nervous influence?

A. Yes, it is the quantity of blood in the moving fibres that gives them their red colour; and the copious supply of nerves gives their great sensibility and mobility.

Q. Have the tendons less blood and fewer nerves in their texture?

A. Yes, much less; their texture is compact and firm, and does not admit of vessels carrying red blood; their office is such, as not to require sensibility; and in consequence their nervous filaments are so small, that they have never yet been traced.

Q. Since tendons have so small blood-vessels and nerves, can adhesion take place in them after they have been ruptured?

A. Yes; the injury irritates and stimulates the ruptured vessels to an increased action, by which, adhesion, though slow in progress, of the ruptured parts is effected.

PHYSIOLOGY OF MUSCULAR MOTION.

Q. What circumstances are to be considered with regard to muscular motion?

A. 1. The intensity of the contraction of the muscle; 2. Its duration; 3. Its quickness; 4. Its extent.

Q. By what circumstances does the intensity of muscular action appear to be regulated?

A. The influence of the brain, and the structure of the muscular fibre; the former when intense bracing up the most delicate and pale fibres to strong exertion, though the muscles generally exert their power in proportion to the size, redness, and strength of the fibres.

Q. Upon what does the duration of muscular contraction depend?

A. Upon the will, varied, however, by the intensity of the contraction and the weakness of the individual.

The change of position removing the strain of exertion from one set of muscles to another, enables the system to bear the effort longer.

Q. Upon what does the rapidity of the contractions depend?

A. Somewhat upon habit; as, in fencing, dancing, &c.; yet as with the same degree of practice different persons have motions of different degrees of quickness, it depends also upon the power of constitution transmitted through the brain.

Q. What is to be said of the extent of muscular contraction?

A. It varies according to the length of the fibres, directed by the will.

Q. How does the muscular contraction differ from that which is the result of wounds of the brain, diseases of that organ, &c.?

A. They are wholly independent of the will, and exert themselves without regard to it.

Q. What varieties do the muscles present in different ages?

A. In the foetus, they are of a pale grey, slightly red, growing with the other parts; with the exception of the muscles of respiration and digestion, at birth they are hardly formed. In youth they are round and beautiful; in adults, more marked and strong, containing more fibrine, ozmazome and iron, than at an early age. In old age, they grow paler, flatter and more weak, their contractility is lessened, and their texture more tough.

OF THE MUSCLES OF THE HEAD.

Q. In treating of the MUSCLES, we shall begin with the head and proceed downwards, in the order best calculated for assisting the memory and explaining the movements of the joints. In the first place, then, describe the origin and insertion of the *Occipĭto-frontālis?*

A. It *arises* from the transverse ridge of the occipital bone, fleshy in the middle, and tendinous near the tem-

poral bones; its broad tendinous expansion runs forwards, adhering to the integuments, becomes fleshy on the os frontis, and is *inserted* into the skin of the eyebrows, and parts under it, into the orbicularis palpebrarum and the os frontis at the inner angle of the orbit.

Q. What is the use of the Occipito-frontalis?

A. It moves the eyebrows upwards, and wrinkles the integuments of the forehead.

Q. What are the origin and termination of the *Corrugator supercilii?*

A. The corrugator supercilii *arises* fleshy from the internal angular process of the os frontis, and is *inserted* into the occipito-frontalis, and orbicularis palpebrarum, at the middle of the superciliary ridge.

Q. What are its actions?

A. Its name denotes its actions; it corrugates the skin of the forehead by drawing the eyebrow down and inwards.

Q. Enumerate the muscles attached to the EXTERNAL EAR?

A. They are three, the attollens aurem, anterior auris, and retrahentes aurem.

Q. Describe the origin, insertion, and use of the *Attollēns aurem?*

A. It *arises*, broad and thin, from the tendon of the occipĭto-frontalis, and is *inserted* into the upper part of the concha or cartilage of the ear; it draws the ear upwards, and makes the parts tense.

Q. Describe the origin, insertion, and use of the *Anterior auris?*

A. It *arises*, thin and membranous, from the posterior part of the zygoma, and is *inserted* into the back of the helix; it elevates the ear.

Q. What are the origin, insertion, and use of the *Retrahentes aurem?*

A. Two or three distinct small muscles *arise* from the upper and outer part of the mastoid process; and are *inserted* by small tendons into the back of the concha; they draw the concha backwards.

Q. What muscles are *peculiar* to the EXTERNAL EAR itself?

A. The *helicis major, helicis minor, tragicus, anti-tragicus, and transversus auris.*

Q. Describe the origin, insertion, and use of the *Helicis major?*

A. It *arises* from the anterior acute part of the helix, ascends upon it, and is *inserted* into the helix above the tragus; it is destined to contract part of the helix, or to render it tenser; but few persons can use these muscles of the external ear.

Q. Describe the *Helicis minor?*

A. It *arises* from the under and fore part of the helix, and is *inserted* into the helix a little higher up; it should contract the fissure over which it passes.

Q. Describe the origin, insertion, and use of the *Tragicus?*

A. It *arises* from the middle and outer part of the concha, and is *inserted* into the point of the tragus; it should pull the point of the tragus forwards.

Q. Describe the origin, insertion, and use of the *Anti-tragicus?*

A. It *arises* from the internal and lower part of the anti-helix, and is *inserted* into the tip of the anti-tragus; it should pull the anti-tragus and anti-helix towards each other.

Q. What are the origin, insertion and use of the *Transversus auris?*

A. It *arises* from the back and prominent part of the concha, and is *inserted* into the outside of the anti-helix; it should draw its attachments towards each other.

Q. Enumerate the muscles of the INTERNAL EAR?

A. They are *three;* the laxātor tympăni, tensor tympăni, and stapedius.

Q. What are the origin, insertion, and use of the *Laxātor tympăni?*

A. It *arises* from the spinous process of the os sphenoides, and running backwards and a little upwards, along with the nerve named *chorda tympăni,* through the fissūra GLASSERI, is *inserted* into the long process

of the mallĕus within the tympănum; it draws the malleus obliquely forwards and outwards, by which it relaxes the membrāna tympăni adhering to the malleus.

Q. Describe the *Tensor tympăni?*

A. It *arises* from the cartilaginous portion of the Eustachian tube, and from the spinous process of the os sphenoides, and running backwards, its tendon turns into the tympanum, and is *inserted* into the handle of the malleus; it pulls the malleus inwards, and makes the membrana tympani more concave and tense.

Q. Describe the origin, insertion, and use of the *Stapedius?*

A. It *arises* from a small cavern in the pars petrosa, near the mastoid process, its tendon passes forwards, through a small hole of the cavern, enters the tympanum, and is *inserted* into the posterior part of the head of the stapes; it pulls the stapes obliquely up and backwards, and thereby stretches the membrana tympani.

Q. What muscles MOVE THE PALPEBRAE?

A. Two; the orbicularis palpebrarum, and levator palpebrae superioris; the movements of the occipito-frontalis also influence their motions.

Q. What are the origin, insertion and use of the *Orbicularis palpebrarum?*

A. It *arises* from the orbitar and nasal processes of the superior maxilla, and from the internal angular process of the frontal bone, and running round the orbit, under the skin, is *inserted* into the integuments of the eyelids, and above into the corrugator supercilii and frontalis; it closes the eyelids, presses the ball and lachrymal organs.

Q. Describe the *Levator palpebrae superioris?*

A. It *arises* from the upper margin of the foramen opticum, and is *inserted* into the cartilage, or tarsus, of the upper eyelid by a broad thin tendon; it raises the eyelid and opens the eye.

Q. What muscles are concerned in moving the EYE-BALL?

A. *Six;* namely, four straight, the levator, depressor, adductor, and abductor oculi; and two oblique,

the obliquus superior or trochlearis, and the obliquus inferior.

Q. Describe the origin, insertion, and uses of the *four recti* muscles?

A. They all four *arise* from the bottom of the orbit, around the foramen opticum, and are *inserted* into the tunica sclerotĭca, near to the cornea; the *Levator* on the upper, the *Depressor* on the under, the *Adductor* on the inner, and the *Abductor* on the outer part of the globe of the eye; each pulls the eye in its own particular direction.

Q. Describe the origin, insertion, and use of the *Obliquus superior* or *trochleāris?*

A. It *arises* from the edge of the foramen opticum between the levator and adductor ocŭli, runs forwards, forms a round tendon, which passes through a cartilaginous pulley fixed behind the internal angular process of the frontal bone, turns downwards, outwards, and backwards under the levator oculi, and is *inserted by* a broad thin tendon into the sclerotic coat half way between the insertion of the levator oculi and the optic nerve; it rôlls the eye-ball, turning the pupil down and outwards.

Q. What are the origin, insertion, and use of the *Obliquus inferior?*

A. The inferior oblique *arises* narrow from the outer edge of the orbitar process of the superior maxilla near the lachrymal groove, and passing obliquely outwards, backwards, and upwards round the ball, is *inserted* by a broad thin tendon into the sclerotic coat between the entrance of the optic nerve and insertion of the abductor oculi; it rolls the eye, turning the pupil upwards and inwards, and during the action of the superior oblique, it pulls the eye forwards.

Q. What *nerves* are distributed to these six muscles of the eye-ball?

A. The third pair, named *Motor oculi*, is distributed to the levator, depressor, adductor, and obliquus inferior; the fourth pair, the *Nervus Patheticus*, is dispersed entirely upon the trochlearis or superior oblique;

and the sixth pair, the *Abducens*, is dispersed entirely upon the abductor.

Q. How many muscles are proper to the NOSE?

A. There is *one* only on each side of it, namely, the compressor naris.

Q. Describe the origin, insertion, and use of the *Compressor naris?*

A. It *arises* narrow from the root of the ala nasi externally, runs upwards, spreading on the cartilage towards the ridge of the nose, and is *inserted* into the anterior extremity of the os nasi, and nasal process of the superior maxilla, and meets with fibres descending from the occipito-frontalis; it compresses the ala in smelling, and by the assistance of the frontalis pulls the ala outwards, corrugates the skin of the nose in expressing certain passions.

Q. What muscles are connected with the LIPS?

A. *Nine;* three above, namely, the levātor angŭli oris, levator labii superioris alaeque nasi, depressor labii superioris alaeque nasi; three below, the depressor angŭli oris, depressor labii inferioris, levator labii inferioris; and three lateral, towards the cheek, the buccinator, zygomatĭcus major, and minor.

Q. Describe the origin, insertion, and use of the *Levator angŭli oris?*

A. It *arises* thin and fleshy from the superior maxilla, between the socket of the first dens molaris and the foramen infra-orbitarium, and is inserted into the angle of the mouth; it draws up the corner of the mouth, and makes the cheek prominent as in smiling.

Q. Describe the *Levator angŭli oris alaeque nasi?*

A. It *arises* partly from the external part of the orbitar, and partly from the upper part of the nasal process of the superior maxilla, and is *inserted* into the upper lip and outer part of the ala nasi; it elevates the upper lip, and dilates the nostril.

Q. Describe the origin, insertion, and action of the *Depressor labii superioris alaeque nasi?*

A. It *arises* thin and fleshy from the alveŏli of the two dentes incivīsi, and canīnus, and running up under

the levator, is *inserted* into the upper lip and root of the ala nasi; it draws the lip and ala downwards.

Q. Describe the *Depressor angŭli oris?*

A. It *arises* broad and fleshy from the lower edge of the inferior maxilla at the side of the chin, is there connected with the platysma myoides, the depressor labii, and skin, and becoming narrower as it ascends, is *inserted* into the angle of the mouth, joining the levator angŭli oris, and zygomatĭcus major; it depresses the corner of the mouth.

Q. Describe the origin, insertion, and use of the *Depressor labii inferioris?*

A. It *arises* broad and fleshy from the inferior part of the lower jaw nearest the chin, ascends obliquely inwards, and is *inserted* into one half of the under lip; it depresses the lip.

Q. What are the origin, insertion, and use of the *Levator labii inferioris?*

A. It *arises* from the roots of the alveoli of two incisivi and the caninus, and is *inserted* into the under lip and skin of the chin; it pulls these parts upwards.

Q. Describe the origin, insertion, and use of the *Buccinātor?*

A. It *arises* tendinous and fleshy, from the ridge extending from the last dens molaris to the coronoid process of the inferior maxilla, and from the superior maxilla between the last dens molaris and pterygoid process of the sphenoid bone, and partly from its extremity, being joined to the constrictor pharyngis superior; it thence runs forwards, adhering to the membrane which lines the mouth, and is *inserted* into the angle of the mouth within the orbicularis oris; it draws the angle of the mouth back and outwards, presses the cheek, and is employed in blowing wind-instruments.

Q. Describe the origin, insertion, and action of the *Zygomatĭcus major?*

A. It *arises* fleshy from the os malae near the zygomatic suture, and descending obliquely forwards is *inserted* into the angle of the mouth, intermixing its fibres with those of the depressor anguli oris and orbicularis;

it draws the angle of the mouth and under lip upwards and outwards, and makes the cheek prominent.

Q. What are the origin, insertion, and use of the *Zygomaticus minor?*

A. It *arises* from the prominent part of the os malae obove the former, and is *inserted* into the upper lip near the corner of the mouth; it raises the angle of the mouth obliquely upwards and outwards.

Q. Describe the *Orbicŭlāris oris?*

A. It is a complete sphincter, composed of the fibres of the superior descending, and of the inferior ascending muscles, decussating each other at the corner of the mouth, and running along the lips to join those of the opposite side; it draws both lips together, and shuts the mouth.

Q. How many muscles are concerned in *raising* the INFERIOR MAXILLA, and shutting the mouth?

A. *Four* on each side; namely, the temporalis, massēter, pterygoidēus internus, and externus.

Q. Is there any *aponeurosis* covering the temporal muscle?

A. Yes; it is a strong tendinous membrane, *arising* from the bones, which give origin to the upper semicircular portion of the temporal muscle, and descending over it, is *inserted* into the zygōma.

Q. Describe the origin, insertion, and use of the *Temporal muscle?*

A. It *arises* fleshy from the semicircular ridge of the lower and lateral part of the parietal bone, from the squamous portion of the temporal, from the external angular process of the frontal, and from the temporal process of the sphenoid bone; its fibres converge, pass down under the zygoma, and form a strong tendon, which embraces, and is *inserted* into the coronoid process of the inferior maxilla; it pulls the jaw upwards, and a little backwards.

Q. Describe the origin, insertion, and use of the *Masseter?*

A. It *arises* by strong tendinous and fleshy fibres from the superior maxilla, where it joins the os malae,

and from the whole length of the under and inner edge of the zygoma, the external fibres slant backwards, and the internal forwards; and it is *inserted* into the angle of the lower jaw and upwards near to the top of the coronoid process; it pulls the jaw upwards, and by means of its decussating fibres, forwards or backwards.

Q. Describe the *Pterygoidēus internus?*

A. It *arises* from the fossa pterygoidēa of the sphenoid and palate-bones, passing downwards and outwards, is *inserted* into the inner side of the angle of the lower jaw as far as the groove; it raises the jaw, and draws it obliquely towards the opposite side.

Q. What are the origin, insertion, and use of the *Pterygoidēus externus?*

A. It *arises* from the outer side of the pterygoid, and root of the temporal process of the sphenoid bones, and from the tuberosity of the superior maxilla, and passing almost horizontally outwards, is *inserted* into the cervix and capsular ligament of the lower jaw; it pulls the jaw towards the opposite side, and with the assistance of its fellow brings it forwards, and draws the capsule from the joint, lest it should be pinched in the motions of the jaw.

Q. What muscles appear superficially on the *fore* and *lateral* part of the NECK?

A. *Two* on each side; the platysma myoides or muscŭlus cutānēus, and the sterno-cleido-mastoidēus.

Q. Describe the origin, insertion, and use of the *Platysma Myoides*, or *Muscŭlus Cutāneus?*

A. It *arises* by fleshy slips from the cellular substance covering the upper parts of the pectoral and deltoid muscles, they unite into a thin muscle, which runs obliquely upwards on the side of the neck, adhering to the skin, and is *inserted* into the side of the lower jaw, and depressor anguli oris, and into the skin; it assists in depressing the lower jaw, angle of the mouth, and skin of the cheek.

Q. Describe the origin, insertion, and use of the *Sterno-cleido-mastoidēus?*

Q 2

A. It *arises* by a round tendinous and a little fleshy head from the sternum, and by another broad and fleshy from the sternal portion of the clavicle, they unite into a strong muscle, which ascends obliquely outwards, being covered by the platysma myoides, is *inserted* by a thick strong tendon into the mastoid process, and becoming thinner as far back as the lambdoidal suture.

Q. What muscles depress the INFERIOR MAXILLA, and OPEN THE MOUTH?

A. *Five* on each side; namely, the digastrĭcus, mylo-hyoidēus, genio-hyoidēus, genio-hyo-glossus, and the platisma myoides.

Q. Describe the origin, insertion, and use of the *Digastrĭcus*?

A. It *arises* fleshy from the fossa at the root of the mastoid process, descends forwards forming a round tendon, which passes through the belly of the stylo-hyoidēus, and *is fixed* by a ligament to the *os hyoides*, from which it receives an addition of muscular and tendinous fibres, ascends obliquely forwards, and becoming again fleshy, is *inserted* into a rough sinuosity on the anterior and inferior edge of the chin at the symphysis; it opens the mouth, or raises the os hyoides as in swallowing.

Q. What are the origin, insertion, and use of the *Mylo-Hyoidēus*?

A. It *arises* broad and fleshy from the inside of the inferior maxilla, between the last dens molaris and the middle of the chin, joined there to its fellow by a tendinous line, descends behind the digastricus, and converging its fibres, is *inserted* into the lower edge of the base or body of the os hyoides; it draws the os hyoides upwards, forwards, and to a side.

Q. Describe the origin, insertion, and use of the *Genio-Hyoidēus*?

A. It *arises* tendinous from a rough protuberance on the inside of the symphysis, becoming broader as it descends, is *inserted* into the base of the os hyoides, under the former; it draws the os hyoides towards the chin; or when the os hyoides is fixed by muscles at-

tached to the sternum, it draws down the chin, and opens the mouth.

Q. Describe the *Genio-hyo-glossus?*

A. It *arises* a little higher from the same rough protuberance on the inside of the symphysis, spreading its fibres like a fan forwards, upwards, and backwards, is *inserted* into the whole length of the tongue, and base of the os hyoides near its cornu; according to the direction of its fibres, it draws the tongue forwards, or backwards, its middle downwards, and makes its upper surface concave: or it pulls the os hyoides forwards, and thrusts the tongue out of the mouth.

Q. What muscles attach the OS HYOIDES to the TRUNK?

A. *Four* on each side; namely, the sterno-hyoidēus, omo-hyoidēus, sterno-thyroidēus, and thyro-hyoidēus.

Q. Describe the *Sterno-hyoidēus?*

A. It *arises* thin and fleshy from the extremity of the first rib, from the upper part of the sternum, and from the sternal extremity of the clavicle, and ascending, is *inserted* into the base of the os hyoides, which it pulls downwards.

Q. Describe the origin, insertion, and use of the *Omo-hyoidēus?*

A. It *arises* thin, broad, and fleshy from the superior costa of the scapula near the semilunar notch, and running obliquely upwards and forwards, becomes tendinous under the sterno-mastoideus, and again fleshy, is *inserted* into the base of the os hyoides at the side of the former; it pulls the os hyoides obliquely downwards; and, together with its fellow, straight downwards.

Q. Describe the origin and insertion of the *Sterno-thyroidēus?*

A. It *arises* fleshy from the upper and inner part of the sternum, and end of the first rib, and is *inserted* into the rough line at the under and lateral part of the thyroid cartilage.

Q. Describe the origin, insertion, and use of the *Thyro-hyoidēus?*

A. It *arises* fleshy from the rough line of the thyroid cartilage at the insertion of the former, and is *inserted* into part of the base, and almost all the cornu of the os hyoides; which it depresses when the former keeps the thyroid cartilage fixed.

Q. What muscles are attached to the TONGUE?

A. Part of the genio-hyo-glossus, the hyo-glossus, lingualis, and stylo-glossus.

Q. Describe the origin, insertion, and use of the *Hyo-glossus?*

A. It *arises* fleshy from the half of the os hyoides, and running upwards and outwards is *inserted* into the side of the tongue near the stylo-glossus; it pulls the tongue inwards and downwards.

Q. Describe the origin, insertion, and use of the *Lingualis muscle?*

A. It *arises* from the lateral part of the root of the tongue, and, running forwards between the hyo-glossus and genio-hyo-glossus, is *inserted* into the tip of the tongue; it contracts the substance of the tongue, and pulls it backwards.

Q. Describe the origin, insertion, and use of the *Stylo-glossus?*

A. It *arises* tendinous and fleshy from the styloid process of the temporal bone and ligament connecting it to the angle of the jaw, and running downwards and forwards, is inserted into the root and side of the tongue near to its apex; it draws the tongue backwards to one side.

Q. What muscles are situated in the FAUCES?

A. *Four* on each side; namely, the constrictor isthmi faucium, palato-pharyngēus, circumflexus vel tonsor palati, levator palati; and the azygos uvŭlae in the middle.

Q. What are the origin, insertion, and use of the *Constrictor isthmi faucium?*

A. It *arises* from the side of the root of the tongue, runs in the doubling of the skin forming the anterior arch of the palate before the amygdăla, and is *inserted* into the velum palati at the root of the uvŭla, where it joins

its fellow: it assists in shutting the passage into the fauces.

Q. Describe the *Palato-pharyngēus?*

A. It *arises* from the middle of the velum palati, from the insertion of the former, and the tendinous expansion of the circumflexus palati, and running within the duplicature of the posterior arch behind the amygdala, backwards to the superior and lateral part of the pharynx, is *inserted* into the edge of the upper and back part of the thyroid cartilage, and back of the pharynx; it assists in shutting the passage into the nostrils, and, in swallowing, conveys the bolus into the pharynx.

Q. Describe the origin, insertion, and use of the *Circumflexus* or *Tensor palati?*

A. It *arises* from the spinous process of the sphenoid bone, from the osseous and cartilaginous parts of the Eustachian tube, and from the root of the internal pterygoid process, runs down along the pterygoideus internus, forms a round tendon, which passes over the hook of the internal pterygoid plate, then spreads out into a tendinous expansion, and is *inserted* into the velum pendŭlum palāti and semilunar edge of the os palati, as far as the suture, where its fibres are joined to those of the two former muscles; it stretches and depresses the velum.

Q. Describe the origin, insertion, and use of the *Lavator palati?*

A. It *arises* tendinous and fleshy from the point of the petrous portion of the temporal bone, and membranous part of the Eustachian tube, and descending, is *inserted* into the whole length of the velum palati, and uniting with its fellow at the root of the uvŭla; it pulls the velum upwards and backwards, and shuts the passage into the nose and mouth.

Q. Describe the origin, insertion, and use of the *Azygos uvŭlae?*

A. It *arises* fleshy from the posterior extremity of the longitudinal palate suture, runs down the whole length of the velum and uvula, adhering to the tendons of the

circumflexi, and is *inserted* into the point of the uvula; it raises and shortens the uvula.

Q. What muscles are concerned in the movements of the PHARYNX?

A. *Four* on each side; the stylo-pharyngēus, the constrictor pharyngis inferior, medius, and superior.

Q. Describe the origin, insertion, and use of the *Stylo-pharyngēus?*

A. It *arises* fleshy from the root of the styloid process, and running downwards and forwards is *inserted* into the side of the pharynx and back part of the thyroid cartilage; it dilates and raises the pharynx, so as to receive the bolus in swallowing, and it elevates the thyroid cartilage.

Q. Describe the *Constrictor pharyngis inferior?*

A. It *arises* from the side of the thyroid and cricoid cartilages, and is *inserted* into its fellow behind, forming a longitudinal tendinous line; it compresses the lower part of the pharynx, and draws it and the larynx a little upwards.

Q. What are the origin, insertion, and use of the *Constrictor pharyngis medius?*

A. It *arises* from the appendix and cornu of the os hyoides, and from the ligament attaching the cornu to the thyroid cartilage, spreading its superior fibres obliquely upwards, and the others more transversely, it is *inserted* into the middle of the cuneiform process of the occipital bone before the foramen magnum, and into its fellow by a tendinous line; it compresses the middle of the pharynx.

Q. What are the origin, insertion, and use of the *Constrictor pharyngis superior?*

A. It *arises* from the cuneiform and pterygoid processes, from the upper and under maxilla near the last alveolar processes, from the back part of the buccinator, root of the tongue, and palate; and is *inserted* into its fellow by a tendinous line on the posterior surface of the pharynx; it compresses the upper part of the pharynx, draws it forwards and upwards.

Q. What muscles are concerned in the movements of the LARYNX?

A. *Four* on each side; the crico-arytaenoidēus posticus, crico-arytaenoideus lateralis, thyro-arytaenoideus, and the arytaenoideus oblīquus; and one common to both sides, the arytaenoideus transversus.

Q. Describe the origin, insertion, and use of the *Crico-arytaenoidēus postīcus.*

A. It *arises* fleshy from the back part of the cricoid cartilage, and is *inserted* by a narrow extremity into the posterior part of the base of the arytēnoid cartilage, which it pulls backwards, making the ligament of the glottis tense, and opening the rima glottĭdis.

Q. Describe the *Crico-arytaenoidēus laterālis*?

A. It *arises* fleshy from the side of the cricoid cartilage, where it is covered by the thyroid, and is *inserted* into the side of the base of the arytēnoid cartilage; it opens the rima glottĭdis.

Q. Describe the origin, insertion, and use of the *Thyro-arytaenoidēus?*

A. It *arises* from the middle and under part of the back of the thyroid cartilage, and running backwards and a little upwards, is *inserted* into the fore part of the arytaenoid cartilage, which it pulls forwards and outwards, and opens the glottis.

Q. Describe the origin, insertion, and use of the *Arytaenoidēus oblīquus?*

A. It *arises* from the base of one of the arytaenoid cartilages, and crossing its fellow obliquely, is *inserted* into the point of the other; it, with its fellow, draws the two arytaenoid cartilages together, and shuts the aperture of the glottis.

Q. Describe the *Arytaenoidēus transversus*?

A. It *arises* from the whole length of the bank of the one arytaenoid cartilage, and running transversely, is *inserted* into the whole length of the other; it draws the arytaenoid cartilages together and closes the rima-glottidis.

Q. What muscles are attached to the EPIGLOTTIS?

A. *Two* on each side; the thyro-epiglottideus, and arytaeno-epiglottideus.

Q. Describe the *Thyro-epiglottidēus?*

A. It *arises* by a few scattered fibres from the thyroid cartilage, and is *inserted* into the side of the epiglottis; it with its fellow draws down the epiglottis upon the rima glottidis, and shuts the aperture.

Q. What are the origin, insertion, and use of the *Arytaeno-epiglottidēus?*

A. It *arises* by a few slender fibres from the lateral and upper part of the arytēnoid cartilage, and running along the outer side of the external rima, is *inserted* into the epiglottis along with the former muscle; it and its fellow pull down the epiglottis and shut the glottis.

Q. What are the *antagonists of these muscles* of the epiglottis.

A. They have no antagonist muscles; but the structure of the cartilage of the epiglottis is so formed, that it turns upwards by its *own elasticity*, and opens the glottis.

Q. What muscles are situated near to the vertebrae on the ANTERIOR PART OF THE NECK?

A. *Four*, the longus colli, recti capitis anterior major, and minor, and rectus capitis lateralis.

Q. Describe the *Longus colli?*

A. It *arises* tendinous and fleshy from the side of the bodies of the three superior dorsal vertebrae, and from the transverse processes of the four inferior cervical vertebrae, and is *inserted* by tendons covered with fibres into the anterior part of the bodies of all the cervical vertebrae; it and its fellow bend the neck forwards.

Q. Describe the *Rectus capitis anterior major?*

A. It *arises* from the fore part of the transverse processes of the four undermost cervical vertebrae, and running up and inwards, is *inserted* into the cuneiform process of the occipital bone; it bends the head forwards.

Q. Describe the origin, insertion, and use of the *Rectus capitis anterior minor?*

A. It *arises* from the fore part of the atlas, and running obliquely inwards on the outside of the former, is

inserted into the cuneiform process immediately before the condyles; it and its fellow assist the rectus major in nodding the head.

Q. Describe the origin, insertion, and use of the *Rectus capitis lateralis?*

A. It *arises* fleshy from the anterior part of the transverse process of the atlas, and running obliquely outwards, is *inserted* into the os occipitis behind the jugular fossa; it pulls the head to one side.

Q. What muscles are situated on the LATERAL PART OF THE NECK?

A. The three Scaleni; namely, the scalēnus anticus, medius, and posticus; and the levator scapulæ.

Q. Describe the origin, insertion and use of the *Scalēnus antīcus?*

A. It *arises* tendinous and fleshy from the upper edge of the first rib near the sternum, and is *inserted* by tendons into the transverse processes of the fourth, fifth, and sixth cervical vertebrae; it pulls the neck to one side, or with the assistance of its fellow it draws the neck forwards.

Q. Describe the *Scalēnus medius?*

A. It *arises* from the upper and outer part of the first rib from its root to near its cartilage, and is *inserted* by strong tendons into the transverse processes of all the cervical vertebrae; it draws the neck to one side; or in conjunct action with its fellow it brings it forwards.

Q. Describe the origin, insertion, and use of the *Scalēnus postīcus?*

A. It *arises* from the upper edge of the second rib near the spine, and is *inserted* into the transverse processes of the fifth and sixth cervical vertebrae; it assists in drawing the neck to one side, or it and its fellow pull the neck forwards.

Q. What are the *actions of all the three scaleni* muscles?

A. They co-operate in pulling the neck to one side, or with their fellows they pull it directly forwards; or, if the neck is fixed erect by the antagonist muscles on its pos-

terior part, they elevate the ribs, and dilate the thorax in difficult respiration.

Q. Describe the origin, insertion, and use of the *Levātor scapŭlae?*

A. It *arises* from the transverse processes of the five superior cervical vertebrae by as many distinct heads, that unite and form a flat muscle, which is *inserted* into the base at the root of the spine, and under the superior angle of the scapula; which it raises, or pulls the neck to one side; or with its fellow, pulls it backwards.

Q. Where is the course of the *subclavian artery* and *nerves?*

A. The subclavian artery, and also the cervical nerves, which form the brachial plexus, pass outwards between the scalenus anticus, and the scalenus medius, to the axilla.

Q. What muscles are attached to the POSTERIOR PART OF THE HEAD?

A. *Seven* on each side; namely, the trapezius, splenius, complexus, trachēlo-mastoideus, rectus capitis postĭcus major, rectus capitis postĭcus minor, and the obliquus capitis superior.

Q. Describe the origin, insertion, and use of the *Trapezius?*

A. It *arises* by a thick round tendon from the middle of the great arched ridge of the occipital bone, and by a tendinous expansion covering the splenius and complexus, from the rough arch extending towards the mastoid process; from its fellow by the intervention of the ligamentum nuchae covering the upper cervical spinous processes, from the spinous processes of the two inferior cervical, and from all those of the dorsal vertebrae, adhering all the length to its fellow, and is *inserted* fleshy into the scapular half of the clavicle, tendinous into the acromion and spine of the scapula; it moves the scapula and clavicle in various directions, and when the scapula is fixed, it and its fellow draw the head backwards.

Q. Describe the origin, insertion, and use of the *Splenius?*

A. It *arises* tendinous from the four superior spi-

nous processes of the dorsal, tendinous and fleshy from the five inferior of the cervical vertebrae; it adheres firmly to the ligamentum nuchae; and at the third cervical vertebra, recedes from its fellow, and is *inserted* by as many tendons into the five superior transverse processes of the cervical vertebrae; and by a tendinous and fleshy portion into the posterior part of the mastoid process, and into the os occipitis near it; it and its fellow pull the head and neck backwards.

Q. What are the origin, insertion, and use of the *Complexus?*

A. It *arises* tendinous and fleshy from the transverse processes of the seven superior dorsal, and four inferior cervical vertebrae, and is *inserted* into the depression between the superior and inferior transverse ridges of the occipital bone; it draws the head backwards and to one side, and with its fellow directly backwards.

Q. Describe the origin, insertion, and use of the *Trachēlo-mastoidēus?*

A. It *arises* from the transverse processes of the three upper dorsal, and five lower cervical vertebrae, where it is connected to the transversalis cervīcis by as many thin tendons, and ascending under the splenius, is *inserted* by a thin tendon into the posterior part of the mastoid process; it pulls the head backwards.

Q. Describe the *Rectus capitis postīcus minor?*

A. It *arises* fleshy from the external part of the spinous process of the second cervical vertebra; becoming broader, it ascends obliquely outwards, and is *inserted* tendinous and fleshy into the inferior transverse ridge of the occipital bone; it draws the head backwards, and assists in its rotation.

Q. Describe the Rectus capitis minor?

A. It *arises* tendinous from the protuberance in the place of a spinous process of the atlas, becoming broader and fleshy, is *inserted* into a depression between the smaller arch and foramen magnum of the os occipitis; it assists in pulling the head backwards.

Q. Describe the origin, insertion, and use of the *Obliquus capitis superīor?*

A. It *arises* from the transverse process of the atlas, and ascending a little inwards, is *inserted* at the outer part of the insertion of the rectus major into the inferior transverse ridge of the occipital bone, behind the mastoid process; it assists in pulling the head backwards.

Remarks.

Q. What muscles particularly strengthen and secure the *articulation* of the head with the atlas?

A. The *two recti capitis interni* vel *anteriores*, the *two recti capitis laterales* on the sternal aspect; and the two recti capitis postīci minores, and the two obliqui capitis superiores on the dorsal aspect.

Q. What muscles *bend the head forwards, or sternad?*

A. The two recti capitis anteriores minores, two recti capitis anteriores majores; two recti capitis laterales, and the two sterno-mastoidēi; and also, when the inferior maxilla and os hyoides are fixed, the two platysma myoides, or latissīmi colli, two digastrīci, two mylohyoidēi, two genio-hyoidēi, and the two genio-hyo-glossi.

Q. What muscles *fix the inferior maxilla* close to the superior?

A. The two temporal, two massēters, and the four pterygoid muscles.

Q. What muscles *fix the os hyoides*, and prevent it from rising upwards, or corōnad?

A. The two omo-hyoidēi, two sterno-hyoidēi, and two thyro-hyoidēi.

Q. What muscles *extend the head backwards, or dorsad?*

A. Part of the two trapezii, the two splenii, two complexi, two recti capitis postīci majōres, and the two trachēlo-mastoidēi.

Q. Why has the head five pairs of such strong muscles to extend it backwards, seeing their antagonists are so weak in proportion to them.

A. The condyles of the os occipĭtis are placed much farther back than the line of equipoise between the

anterior and posterior parts of the head; hence the head by its own gravity naturally falls forwards; strong muscles therefore are necessary to keep it perpendicularly erect; particularly in carrying burdens on the head.

Q. What is the use of the *ligamentum nuchae?*

A. It assists these strong muscles in their continued action of keeping the head erect.

Q. What muscles perform the *rotatory motions of the head?*

A. The two obliqui capitis inferiores, which *arise* from the spinous process of the second cervical vertebra, and running upwards and outwards, are *inserted* into the transverse processes of the atlas, are wholly rotators of the head; many others assist them, namely, the recti postici majores, trachelo-mastoidei, complexi, splenii, trapezii, sterno-mastoidei, and latissimi colli.

Q. How far can they turn the head round from the front, or sternal aspect?

A. The symphysis menti can be turned, generally speaking, to the right, or left, from the sternal aspect, about twenty-six degrees, or the seventh part of a circle.

Q. Do the cervical vertebrae assist in the rotatory motions of the head?

A. Motions of the head *dextrad* and *sinistrad*, are performed by the rolling of the atlas on the horizontal plane of the second vertebra, from which the processus dentatus is raised perpendicularly to regulate and steady its motions. The other cervical vertebrae are so bound together by ligaments and muscles, by the form of their articulations, of their spinous processes, and inter-vertebral cartilages, that they have no sensible motion on their individual axis; but when taken together, they are susceptible of a considerable contortion along with the head.

Q. What muscles prevent the *cervical vertebrae from rotating?*

A. The inter-spinales colli occupy the spaces between the bifurcated extremities of the spinous pro-

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cesses, *arising* from each inferior, and *inserted* into the superior, and the inter-transversales colli, occupying the spaces between the bifurcated extremities of the transverse processes, fix them together, and tend to draw the neck to one side.

Q. What muscles arise from the SCAPULA?

A. *Seven*, the greater part of the deltoid, supra-spinātus, infra-spinatus, teres minor, teres major, corăco-brachiālis, and sub-scapulāris.

Q. Describe the origin, insertion, and use of the *Deltoides?*

A. It *arises* fleshy from the scapular portion of the clavicle unoccupied by the pectorālis major, from the acromion, and lower margin of the spine of the scapula; and is *inserted* by a short strong tendon into a rough surface on the middle of the outside of the humerus between the biceps, and short head of the triceps extensor, and just above the origin of the brachialis internus; it raises the arm upwards to a plane with the shoulder, turns it a little backwards or forwards.

Q. What are the origin, insertion, and use of the *Supra-spinātus?*

A. It *arises* fleshy from the scapula above the spine, passes under the acromion, adheres to the capsular ligament, and is *inserted* tendinous into the large tubercle on the head of the os humeri at the outside of the bicipital groove; it raises the arm and prevents the capsular ligament from being pinched. It is covered by a strong aponeurōsis.

Q. Describe the origin, insertion, and use of the *Infra-spinātus?*

A. It arises fleshy from the scapula below the spine, and adhering to the capsular ligament, is *inserted* by a flat thick tendon into the upper and outer part of the large tubercle of the head of the os humeri; it turns the humerus outwards, and raises the arm.

Q. What are the origin, insertion, and use of the *Teres minor?*

A. It *arises* fleshy from the inferior costa of the sca-

pula, runs along the inferior edge of the infra-spinatus, adheres to the capsular ligament, and is *inserted* tendinous into the back part of the large tubercle below the infra-spinatus; it rolls the humerus outwards, draws it back, and prevents the capsular ligament from being pinched in the motions of the joint.

Q. Describe the *Teres major?*

A. It *arises* fleshy from the outside of the inferior angle, and thick rough part of the inferior costa of the scapula, and running forwards and upwards along the under edge of the teres minor, passes the infra-spinatus, to which some fibres adhere, forms a broad flat tendon, which, accompanied by the tendon of the latissimus dorsi passing under the humerus, is *inserted* into the ridge at the inner side of the bicipital groove; it rolls the humerus inwards, and pulls it backwards.

Q. Describe the origin, insertion, and use of the *Corăco-brachialis?*

A. It *arises* tendinous and fleshy from the point of the corăcoid process of the scapula, together with the short head of the biceps, to which it adheres, and is *inserted* into the internal part of the middle of the humerus, whence it sends down an aponeurosis to the internal condyle: it assists in raising the arm obliquely forwards.

Q. Describe the origin, insertion, and use of the *Subscapulāris?*

A. It *arises* fleshy from the three costae, and whole internal surface of the scapula, composed of tendinous and fleshy portions, which converge, and form a tendon, which passes under the coraco-brachialis and short head of the biceps; adheres to the capsular ligament, and is *inserted* into the upper part of the small tubercle at the head of the humerus; it rolls the humerus inwards, and draws it to the side of the trunk.

Q. What other muscles are concerned in the *motions of the* SHOULDER-JOINT?

A. The pectoralis major, and minor, biceps, and the latissimus dorsi.

Q. Describe the origin, insertion, and use of the *Pectoralis major?*

A. It *arises* from the anterior half of the clavicle, from nearly the whole length of the sternum, and from the cartilages of the fifth and sixth ribs, its fibres converge towards the axilla, those of the superior portion run on the anterior part, the fibes of the inferior ascend between them and the ribs; they form a broad twisted tendon, which is *inserted* into the ridge at the outer side of the bicipital groove, about a fourth part of the length of the humerus from its head, just above the insertion of the deltoid, and below that of the latissimus dorsi on the opposite side of the groove.

Q. What are the origin, insertion, and use of the *Pectoralis minor?*

A. It *arises* serrated, tendinous and fleshy, from the third, fourth, and fifth ribs, near their cartilages, becomes round, thick, and narrower, as it ascends obliquely, and is *inserted* by a short flat tendon into the point of the coracoid process of the scapula.

Q. Describe the origin, and insertion of the *Biceps flexor cubiti?*

A. It *arises* by two heads; the long one from the upper margin of the glenoid cavity by a strong tendon, which passes over the round head of the humerus within the capsular ligament of the joint; descends in the groove of the os humeri, enclosed by a membranous sheath formed by the tendons of adjacent muscles: the short head *arises* from the coracoid process of the scapula, along with the coraco-brachialis, joins the former head a little below the middle of the humerus, forming a fleshy belly, which sends off a strong tendon down the fore part of the elbow-joint, which is *inserted* into the tubercle of the radius.

Q. Describe the origin, and insertion of the *Latissimus dorsi?*

A. It *arises* tendinous from the spinous processes of the os sacrum, the lumbar, and seven dorsal vertebrae, from the posterior part of the spine of the ilium, and from the extremities of the four inferior false ribs; it forms a broad thin muscle, the inferior fibres of which run upwards and outwards, and the superior ones transversely over the inferior angle of the scapula, and near

the axilla, converge, and form a flat tendon, twisted similar to the pectoralis major; and is *inserted* into the inner edge of the bicipital groove.

SURGICAL PATHOLOGY OF THE SHOULDER.

Q. Since the SHOULDER-JOINT is so well secured by ligaments and muscles, as we have just seen, *is it often dislocated?*

A. Its motions are very free and extensive; and as the arm is always used as a defence or safety, in cases of danger and accidents, the shoulder-joint is much exposed, and frequently dislocated.

Q. *In what positions* can the head of the humerus be forced out of the glenoid cavity of the scapula?

A. It can scarcely be forced upwards; it may be lodged in the axilla downwards, under the pectoral muscle forwards, or under the spine of the scapula backwards.

Q. What prevents the head of the humerus from being *dislocated upwards?*

A. The coracoid, and acromion processes; the conoid and trapezoid ligaments extending from the coracoid process to the end of the clavicle; the anterior triangular ligament of the scapula, extending from the external surface of the coracoid to that of the acromion process, confines the tendon of the supra-spinatus down in situ; the long head of the biceps flexor cubiti; the capsular ligament; the deltoid; the coraco-brachialis; the supra-spinatus particularly, and the infra-spinatus, and subscapularis in a considerable degree, counteract any force thrusting the head of the humerus upwards.

Q. What prevents the head of the humerus from being *luxated downwards*, in the axilla?

A. The capsular ligament; the tendon of the long head of the biceps; the supra-spinatus, in a particular manner, and the upper part of the pectoralis major; the teres minor, the teres major, the latissimus dorsi, and the long head of the triceps extensor cubiti, also contribute in preventing luxation downwards.

Q. What muscles prevent the head of the humerus from *passing forward* in the application of a force producing luxation under the pectoral muscle?

A. The capsular ligament; the tendon of the biceps; the sub-scapularis; the supra and infra-spinati; the teres minor, and major, and the pectoralis minor.

Q. What opposes the head of the humerus in being forced *backwards in luxation?*

A. The capsular ligament; the tendon of the biceps; the pectoralis major, and the supra-spinatus; the tendons too of the infra-spinatus, and teres minor, lying close upon the capsular ligament, may have some effect in preventing the head of the humerus from passing under them.

Q. When the *head of the humerus is forced forwards* under the pectoral muscles in luxation, *what muscles are most upon the stretch?*

A. The supra, and infra-spinatus, the teres minor, and the sub-scapularis; the tendon of the biceps; the latissimus dorsi also, and teres major, to a certain degree, keep the arm down and backwards, with the elbow outwards, and the fore-arm bent by the tendon of the biceps being pulled upwards.

Q. Does any *rupture* of parts happen in such a dislocation?

A. The capsular ligament must be ruptured, and perhaps also the sheath of the tendon of the biceps: the tendons of the muscles of the scapula have been supposed to be ruptured also in luxation of the head of the humerus forwards; but this seems improbable, from the situation of the parts: the supra, and infra-spinatus are very much over-stretched, but the position of the scapula, and that of the humerus render it very probable, that the head of the humerus is generally dislocated forwards under the pectoral muscle without any rupture of their tendons having taken place; a rupture of them indeed is possible, and may happen in some cases.

Q. When the head of the humerus is lodged under the pectoral muscles, what are the *means* necessary *to reduce it?*

A. The patient being laid on his opposite side, the fore-arm should be kept bent to relax the biceps; and a towel should be applied round the humerus under the insertion of the pectoralis, near the axilla, and given to an assistant. Being now ready, the surgeon should raise the humerus gradually upwards, till it be nearly in a line with the superior costa of the scapula, to relax the supra and infra spinatus; and in proportion as he raises it, he should pull gently, keeping the fore-arm in the same position, in order to disentangle the head of the bone, and to bring it within the capsular ligament. Having attained this, he should next order his assistant to pull the humerus outwards from the side of the trunk, by means of the towel under the axilla, while the surgeon, keeping his pull, should use the fore-arm as a lever to rotate the humerus outwards, in order to favour the relaxation and action of the supra, and infra-spinatus, and teres minor, to draw it towards its socket. When these muscles are first relaxed as much as possible, and the head of the humerus brought into a favourable situation, the assistant must keep a steady pull, and the surgeon should bring down the humerus to the patient's side, rotating it inwards; during which, the muscles generally bring the head of the humerus into the glenoid cavity of the scapula.

Q. When the *head of the humerus is dislocated backwards* under the spine of the scapula, what muscles are kept too much stretched?

A. The pectoralis major is very much stretched; the supra-spinatus, sub-scapularis, teres major, and latissimus dorsi, are considerably over-stretched.

Q. What means are necessary *to reduce such a luxation?*

A. The patient is to be laid on his opposite side, and a towel put round the humerus and given to an assistant, as in luxation forwards, the surgeon is to keep the fore-arm in the same degree of flexion, and the humerus in the same position of rotation, while he pulls gently downwards by a hold above the condyles, and, at the same time, orders his assistant to pull gradually increas-

ing the force outwards from the trunk. Having thus brought the head of the humerus from under the spine of the scapula, and within the capsular ligament, he is now to raise the arm gradually, rotating the fore-arm forwards and rather outwards, the assistant all the while keeping a firm and steady pull; he is next to order his assistant to keep a strong steady pull, while he himself brings down the humerus to the patient's side, with the fore-arm bent obliquely forwards on the abdomen; during which, the different muscles being brought into action, will draw the head of the humerus into the glenoid cavity.

Q. What muscles are situated ON THE HUMERUS?

A. Two before, the Biceps flexor cubiti, and the Brachialis internus; and two behind, the Triceps extensor cubiti, and the Anconēus.

Q. Are the muscles of the arm covered by an *Aponeurosis?*

A. The greater part of the superior extremity is covered by a tendinous membrane, or aponeurosis, which arises from the bones and muscles of the shoulder; it incloses the flexors and extensors of the fore-arm, and adheres to the ridges and condyles of the humerus: at the bend of the elbow it receives additions from the tendons of the biceps and triceps. It binds the muscles in their relative situations.

Q. Recapitulate the origin, insertion, and use of the *Biceps?*

A. It arises by two heads, the long one *arises* tendinous from the upper margin of the glenoid cavity, and the short head *arises* from the coracoid process of the scapula; they unite and form a thick fleshy belly a little below the middle of the humerus, and it sends off a strong tendon, which is *inserted* into the tubercle of the radius; it is an extensor, and adductor of the humerus, a flexor of the elbow-joint, and a supinator of the hand.

Q. Describe the origin, insertion, and use of the *Brachiālis internus?*

A. It *arises* fleshy from each side of the insertion of the deltoid, covering all, and adhering to most of the fore part of the humerus; it runs over the elbow-joint, adhering to the capsular ligament, and is *inserted* by a strong short tendon into the coronoid process of the ulna; it bends the elbow-joint and prevents the capsular ligament from being pinched.

Q. Describe the origins, insertion, and use of the *Triceps extensor cubĭti?*

A. The *long head arises* broad and tendinous from the inferior costa of the scapula near its cervix; the *short head arises* from the back part of the humerus a little below the large tubercle; the *third head*, called Brachialius externus, *arises* from the back part of the humerus near the insertion of the teres major; these heads unite about the middle of the bone, and cover the whole of its posterior part, adhering to it in its course; the muscle forms a strong thick tendon, which is *inserted* into the *Olecranon* and partly into the condyles, adhering to the capsular ligament; it extends the fore-arm.

Q. Describe the origin, insertion, and use of the *Anconēus?*

A. It *arises* tendinous from the posterior part of the external condyle of the humerus, becomes triangular and fleshy, receives an accession of fibres from the triceps, and is *inserted* into the ridge on the posterior and outer part of the ulna, a little below the olecranon; it assists the triceps in extending the fore-arm.

Q. How are the MUSCLES OF THE FORE-ARM classed?

A. They may be divided into four classes, namely, flexors, extensors, supinators, and pronators.

Q. What muscles are *Flexors?*

A. *Three* for the carpus, viz. the palmaris longus, flexor carpi radialis, and flexor carpi ulnaris; *two* long flexors, and the lumbricāles, for the fingers; namely, the flexor digitorum sublimis vel perforatus, flexor profundus vel perfŏrans.

Q. What muscles are *Extensors?*

A, *Three* for the hand, namely, the extensor carpi radialis longior, and brevior, and the extensor carpi ulnaris; and *one* for the fingers, viz. the extensor digitorum communis.

Q. What muscles are *Supinators* of the hand?

A. *Four;* The biceps flexor cubiti, the supinator radii longus, and brevis, and the extensor secundi internodii pollicis.

Q. What muscles are *Pronators* of the hand?

A. *Two* chiefly; the pronator radii teres, and pronator radii quadratus; and these three also assist the former, viz. the palmaris longus, flexor carpi radialis, and flexor digitorum sublimis.

Q. What *muscles arise* from the *Internal,* or *Ulnar Condyle* of the humerus?

A. *Six;* the palmaris longus, flexor carpi radialis, flexor carpi ulnaris, flexor digitorum sublimis vel perforatus, pronator radii teres, and the flexor longus pollicis manus.

Q. What *muscles arise* from the *External* or *Radial Condyle* of the os humeri?

A. *Six;* the extensor carpi radialis longior; extensor carpi radialis brevior; extensor carpi ulnaris; extensor digitorum communis; supinator radii longus; and supinator radii brevis.

Q. What muscles *arise from the body of the Radius?*

A. *Two,* from its body; part of the flexor longus pollicis manus, and part of the extensor ossis metacarpi pollicis.

Q. What muscles arise *from the body of the Ulna?*

A. *Six;* the flexor digitorum profundus, vel perforans; pronator radii quadratus; part of the extensor ossis metacarpi pollicis; extensor primi internodii pollicis; extensor secundi internodii; and the indicator.

Q. Are the muscles of the fore-arm covered by a *Fascia?*

A. Yes; on removing the integuments, we see a strong fascia continued from the intermuscular ligaments, which pass downwards to the condyles of the os

humeri; it receives additions from the tendons of the triceps and biceps, forms a strong covering to the muscles, gives off partitions among them, and is spent upon the hand.

Q. Describe the origin, insertion and use of the *Palmaris longus?*

A. It *arises* by a muscular mass in common with other muscles from the internal condyle of the humerus, becomes fleshy, sends off a long slender tendon, which is *inserted* into the ligamentum carpi annulare anterius, and aponeurosis palmaris; it bends the hand, and brings it to pronation, and stretches the palmar aponeurosis.

Q. What are the origin, insertion, and use of the *Flexor carpi radialis?*

A. It *arises* from the inner condyle and upper part of the ulna, forms a long tendon, which passing in a groove or fossa of the os trapezium, is *inserted* into the thenal and upper part of the metacarpal bone of the fore-fingers; it bends the wrist, and assists in pronation.

Q. What are the origin, insertion and use of the *Flexor carpi ulnaris?*

A. It *arises* from the inner condyle and side of the olecranon, runs down the internal side of the ulna, from which it receives part of its origin, sends down a strong tendon, which is *inserted* into the os pisiforme; it bends the wrist.

Q. Describe the origin, insertion, and use of the *Flexor digitorum sublimis* vel *perforatus?*

A. It *arises* from the inner condyle, and root of the coronoid process, and fore part of the radius; becoming fleshy, it sends off four tendons before it passes under the ligamentum carpi annulare, which at the extremity of the first phalanx of the fingers are split to form a passage for the tendons of the perforans, and are *inserted* into the anterior and upper part of the second phalanx; it bends the second, and then the first phalanges of the fingers.

Q. What are the origin, insertion, and use of the *Pronator radii teres?*

A. It *arises* from the inner condyle and coronoid process, runs obliquely across the upper part of the flexors of the wrist, and is *inserted* into the middle of the radius on its posterior part; it rolls the radius inwards, and brings the hand to pronation.

Q. Describe the origin, insertion, and use of the *Flexor longus pollicis manus?*

A. It *arises* from the fore part of the radius below its tubercle, interosseous ligament, and inner condyle, sends off a tendon, which passes under the annular ligament, and is *inserted* into the extreme phalanx of the thumb; it bends the most distant joint of the thumb.

Q. Let us now turn our attention to the muscles which arise from the *Radial* or *External Condyle* of the humerus; and, in the first place, describe the *Extensor carpi radialis longior?*

A. It *arises* from the lower part of the external ridge of the humerus and upper part of its condyle, forms a thick short belly, which passes over the side of the joint, and about the middle of the radius forms a tendon, which runs through a groove in the back part of the distant extremity of the radius, and is *inserted* into the upper and posterior part of the metacarpal bone of the fore finger; it extends the wrist and assists in bending the elbow-joint.

Q. Describe the *Extensor carpi radialis brevior?*

A. It *arises* tendinous from the under and back part of the external condyle, in a mass with the extensor longior, and from the external lateral ligament, forms a thick belly, which sends down a tendon, that accompanies the former in its course through the groove, and under the annular ligament, and is *inserted* into the upper and back part of the metacarpal bone of the middle finger; it extends the wrist, and draws the hand *radiad*, or towards the thumb.

Q. Describe the origin, insertion, and use of the *Extensor carpi ulnaris?*

A. It *arises* tendinous from the upper part of the ex-

ternal condyle, and fleshy from the posterior part of the ulna, where it passes over it, sends down a strong tendon, which passes through a groove in the back and lower end of the ulna, and is *inserted* into the posterior and upper part of the metacarpal bone of the little finger; it extends the wrist, and draws the hand *ulnad*, or towards the little finger.

Q. Describe the origin, insertion, and use of the *Extensor digitorum communis?*

A. It *arises* from the external condyle, passes down the back part of the arm, adheres to the ulna where it passes over it, and terminates in four flat tendons, which pass under the annular ligament in a depression on the back, and under part of the end of the radius, and are *inserted* into the posterior part of all the bones of the fingers by a tendinous expansion; it extends all the joints of the fingers.

Q. Describe the origin, course, insertion, and use of the *Supinator radii longus?*

A. It *arises* from the ridge, nearly as high as the middle of the humerus, leading to the external condyle, forms a thick fleshy belly where it passes over the side of the elbow-joint, becomes tapering, and sends off a round tendon, which running along the outer edge of the radius, is *inserted* into the outer side of the carpal end of the radius; it rolls the radius outwards, and performs supination of the hand; it is also a flexor of the elbow-joint.

Q. Describe the *Supinator radii brevis?*

A. It *arises* from the external condyle, from the ridge below the coronoid process of the ulna, and from the interosseous ligament, passes over the external and upper part of the radius, and is *inserted* into the upper and outer edge of its tubercle, and into the ridge descending obliquely from it; it rolls the radius outwards, and brings the hand into the supine position.

Q. What are the origin, insertion and use of the two muscles, the *Flexor longus pollicis manus*, and the *Extensor ossis metacarpi pollicis*, which partly arise from the *body* of the radius?

A. The former we have described; the latter *arises* from the posterior part of the middle of the radius, ulna, and the interosseous ligament, runs down obliquely over the radius, and sends off one or two tendons, which pass through an annular sheath in a groove at the outer side of the extremity of the radius, and are *inserted* into the os trapezium, and upper and back part of the metacarpal bone of the thumb; it extends the metacarpal bone outwards from the fingers, and assists in bending the wrist radiad.

Q. Describe the muscles which arise from the ANTERIOR OF THENAL ASPECT OF THE ULNA; and, first, the origin, insertion, and use of the *Flexor digitorum profundus* vel *perfŏrans?*

A. It *arises* from the external and upper part of the ulna, from its anterior part, and interosseous ligament, forms a thick mass, which sends off four tendons, which pass together under the annular ligament of the wrist, separate, and pass through the slits in the tendons of the flexor sublimis, and are *inserted* into the anterior and upper part of the third phalanx of the fingers; it bends the last joint of the fingers.

Q. Describe the origin, insertion, and use of the *Pronator radii quadratus?*

A. It *arises* broad, tendinous, and fleshy, from the inner edge and under end of the ulna, about two inches in length, runs transversely, adhering to the interosseous ligament, and is *inserted* into the lower and anterior part of the radius opposite to its origin; it turns the radius inwards, and brings the hand into pronation.

Q. Describe the muscles also, which arise from the BACK OF ANCONAL ASPECT OF THE ULNA, beginning with the *Extensor primi*, and *secundi internodii pollicis?*

A. These muscles *arise* from the back part of the ulna, the *primus* below its middle, and the *secundus* above it; and from the interosseous ligament, each sends down a tendon, which passes through a groove at the inner and back part of the radius; the tendon of the *primus* is *inserted* into the posterior part of the first bone of the

thumb; that of the *secundus* into the posterior part of the last bone; they extend the respective bones of the thumb.

Q. As we have described the *Extensor ossis metacarpi pollicis*, which partly arises from the anconal aspect of the ulna; describe, lastly, the *Indicator?*

A. It *arises* from the back and middle part of the ulna, and interosseous ligament, sends down a tendon, which passes through the annular ligament of the wrist, together with the extensor digitorum communis, and is *inserted* into the posterior part of the fore-finger.

SURGICAL PATHOLOGY OF THE ELBOW JOINT.

Q. What muscles are *extensors of the elbow-joint?*

A. *Two;* the Triceps extensor cubiti, and the Anconēus.

Q. What muscles are *flexors of the elbow-joint?*

A. *Eight;* the biceps flexor cubiti, brachialis internus, palmaris longus, flexor carpi radialis, flexor carpi ulnaris, supinator radii longus, pronator radii teres, and the flexor digitorum sublimis.

Q. Do the flexors of this joint appear more powerful than the extensors?

A. The same general law of the system holds in this elbow-joint as well as in others; the extensors, though few, are strong, and act with a long and powerful lever; the flexors are numerous, and co-operate in the performance of their action; some act with the longest lever, or the greatest power, at the commencement of the flexion; others have their lever, or power of action, increased, as the flexion is continued: the power of the extensors too at the commencement of flexion is inconsiderable; but it increases as the flexion becomes greater, in consequence of their lever becoming longer by the olecranon projecting farthor from the centre of motion.

Q. In how many different ways can the ELBOW-JOINT BE DISLOCATED?

A. It may happen in *three ways;* the olecranon may

be fractured, and the humerus displaced forwards, which is rather uncommon; or the ulna and radius may be forced backwards, when the extensors and also the flexors pull the ulna upwards, and place the coronoid process in the cavity, which the olecranon naturally occupies in extension of the fore-arm: or the radius may be displaced from the humerus, and the ulna forced out of the trochlea upon the outer articular surface, which the radius naturally occupies.

Q. What *symptoms* denote the fracture of the olecranon, and the ends of the ulna and radius *dislocated forwards?*

A. The elbow is lost, the back part is concave, and the fore-arm is bent backwards contrary to the natural flexion; while the olecranon is sometimes separated, pulled up, and forms a bump on the humerus behind the condyles.

Q. What *symptoms* denote a *luxation* of the ulna *backwards*, when the coronoid process slips into the olecranon-cavity of the humerus?

A. The arm is much shorter; is kept a little bent; cannot be moved without exciting great pain; the olecranon projects considerably, and is much farther up the humerus.

Q. Is the *coronoid* process not *fractured* in such a luxation?

A. Sometimes it is; but a luxation of this kind can happen without a fracture of bones.

Q. What are the *symptoms* of a *luxation laterally*, when the ulna occupies the place of the radius?

A. The distance between the internal condyle of the humerus and the olecranon is much greater than natural; the head of the radius may often be felt projecting; the motions of flexion and extension are imperfect and painful; and rotation is very imperfect and difficult.

Q. How is the first *dislocation*, viz. of the ends of the bones forwards, and the fractured olecranon, to be *reduced?*

A. The fore-arm should be gently pulled, and, in the mean time, the articular surface of the humerus should

be replaced in the sigmoid cavity of the ulna; and the fore-arm should then be fully extended and a bandage applied round the under part of the humerus to keep down the fractured olecranon in contact with the end of the ulna, whence it had been torn.

Q. When the *luxation* is *backwards*, and the coronoid process is in the posterior cavity of the humerus, how is the *reduction best accomplished?*

A. The humerus is to be kept down near to the patient's side, that the triceps extensor may be more relaxed; the fore-arm is to be kept nearly in the same state of slight flexion; and the upper end of the ulna is to be pulled gently anconad, while a gentle distending force is applied to the fore-arm to pull down the ulna; when the ulna is thus disengaged, and brought down, the fore-arm should be suddenly bent, and the flexors will bring in the joint; care being taken at this time to keep the ulna well towards the internal condyle of the humerus, lest it should be placed on the outer surface naturally occupied by the concave apex of the head of the radius.

Q. How is the *lateral luxation to be reduced,* when the sigmoid cavity of the ulna occupies the outer surface, on which the radius naturally plays?

A. By keeping the fore-arm slightly bent, that both the extensors and flexors may be as much relaxed as possible; by using a slight distending force in that position to disengage the surfaces of the articulating bones; and, at the same time, to pull the ulna towards the internal condyle, or ulnad; and when opposite to its proper situation, to bend the fore-arm, immediately stopping the distension, that the joint may be replaced: if flexion and extension can be performed, the joint is properly reduced; the head of the radius should also be put into its proper semilunar cavity; and if rotation can be easily performed, it is rightly placed.

Q. What *muscles extend the wrist* anconad?

A. *Five;* the extensor carpi radialis longior, and brevior, extensor secundi internodii pollicis, indicator, and extensor digitorum communis.

Q. What muscles *bend the wrist thenad?*

A. *Six;* the flexor carpi radialis, flexor carpi ulnaris, palmaris longus, flexor digitorum sublimis, flexor digitorum profundus, and flexor longus pollicis.

Q. What muscles *draw the hand radiad,* or towards the thumb?

A. *Five;* the flexor longus pollicis; extensor primi internodii; extensor carpi radialis longior, and brevior; and the flexor carpi radialis.

Q. What muscles *draw the hand ulnad,* or towards the little finger?

A. *Six;* the extensor carpi ulnaris, abductor minimi digiti, extensor digitorum communis, flexor carpi ulnaris, flexor digitorum sublimis, et profundus.

Q. In what aspects can the bones of the carpal-joint be *dislocated?*

A. The wrist may be luxated either backwards, anconad; or forwards, thenad: but scarcely ever lateral.

Q. In what manner is *luxation* either forwards or backwards to be *reduced?*

A. Extension of the joint with a gradually increased pulling force will disengage the ends of the bones, and when in a proper position, the muscles will replace the carpal bones in the articular cavity of the radius.

Q. Why is the carpal joint seldom, if ever, dislocated to one side?

A. The styloid process of the radius projecting on the one side, and the strong lateral ligament attaching it to the os scaphoides; the styloid process of the ulna projecting on the other side of the articulation, and the strong lateral ligament also attaching it firmly to the cuneiform and pisiform bones, prevent the oval articular surface of the carpal bones, viz. the os scaphoides and lunare, from being forced either to the one side or the other.

Q. May not one of the styloid processes be fractured, the lateral ligament ruptured, and the carpal-joint be dislocated to one side?

A. Yes; but the position of the hand to one side will point out the nature of the injury.

Q. Is a lateral luxation of that kind to be reduced as the other forwards, or backwards?

A. A gradually increased distending force is first to be employed, and in the mean time, when the bones are disengaged, their articular surfaces are to be brought together, by bringing the hand straight into its natural position.

Q. How many muscles has the THUMB?

A. *Eight;* namely, three flexors, three extensors, an abductor, and an adductor.

Q. Having described the *flexor longus pollicis* formerly; mention now the origin and insertion of the *Flexor brevis pollicis manus?*

A. It *arises* from the ossa, trapezoides, magnum, and unciforme; is divided into two portions by the tendon of the flexor longus pollicis, and is *inserted* into the first bone of the thumb, and ossa sesamoidea.

Q. Describe the origin and insertion of the *Flexor ossis metacarpi pollicis* vel *opponens pollicis?*

A. It *arises* from the os trapezium and ligamentum carpi annulare anterius, and is *inserted* into the under and anterior part of the metacarpal bone.

Q. Having already described the extensors of the thumb; mention now the origin, insertion, and use of the Abductor?

A. The *Abductor pollicis manus arises* from the ligamentum carpi annulare, and os trapezium, and is *inserted* into the outer side of the root of the first bone of the thumb, which it draws from the fingers.

Q. Describe the origin, insertion, and use of the *Adductor pollicis?*

A. It *arises* from nearly the whole length of the metacarpal bone of the middle finger, crossing that of the fore finger, it converges into a short tendon, which is *inserted* into the inner part of the root of the first bone of the thumb, which it draws towards the fingers.

Q. Having considered the Indicator, describe the *Abductor indicis?*

A. It *arises* from the os trapezium, and upper and

inner part of the metacarpal bone of the thumb, and is *inserted* by a short tendon into the back and outer part of the first bone of the fore-finger, which it draws towards the thumb.

Q. How many muscles are peculiar to the LITTLE FINGER?

A. *Three;* an abductor, adductor, and a flexor.

Q. Describe the origin, insertion, and use of the *Abductor minimi digiti?*

A. It *arises* from the os pisiforme and ligamentum carpi annulare near it, and is *inserted* into the inner or ulnar side of the upper end of the first bone of the little finger; which it draws from the rest.

Q. Describe the *Adductor metacarpi minimi digiti manus?*

A. It *arises* from the os unciforme and ligamentum carpi annulare next it, and is *inserted* into the fore and inner part of the metacarpal bone of the little finger.

Q. Describe the origin, insertion, and use of the *Flexor parvus minimi digiti?*

A. It *arises* from the outer side of the os unciforme, and annular ligament near it, and is *inserted* by a round tendon into the inner and anterior part of the base of the first phalanx of the little finger.

Q. What muscles are comprehended by the *Interossei interni?*

A. *Four;* the prior indicis, posterior indicis, prior annularis, and interosseus auricularis.

Q. Describe the Prior and Posterior Indicis?

A. The *Prior indicis arises* from the upper and outer; the *Posterior indicis* from the upper and inner part of the metacarpal bone of the fore-finger; and they are *inserted* into the tendinous expansion of the extensor digitorum.

Q. What are the origin and insertion of the *Prior annularis?*

A. It *arises* from the outside of the metacarpal bone of the ring-finger, and is *inserted* into the outer side of the tendinous expansion of the same finger.

Q. Describe the *Interosseus auricularis?*

A. It *arises* from the outside of the metacarpal bone, and is *inserted* into the outside of the tendinous expansion on the back part of the little-finger.

Q. How many *Interossei externi* are there?

A. Three; the *prior medii digiti*, which *arises* from the contiguous side of the metacarpal bones of the fore and middle fingers; the *posterior medii digiti*, from the corresponding metacarpal bones of the middle and ring-fingers; and the *posterior annularis* from those of the ring and little-fingers, and are *inserted* into the tendinous expansion of the extensor digitorum communis.

Q. When the joints of the fingers or thumb are *dislocated*, how are they to be *reduced*?

A. The finger, or thumb, which is luxated, should be gently pulled, and placed in its natural position, and if properly reduced, the joint will move easily in flexion and extension.

MUSCLES OF THE TRUNK.

Q. What muscles are situated on the POSTERIOR PART *of the trunk*, besides those already mentioned as attached to the cervical vertebrae, or arising from the scapulae?

A. The rhomboidēus, longissimus dorsi, spinalis dorsi, semi-spinalis dorsi, and multifidus spinae.

Q. Describe the origin, insertion, and use of the *Rhomboidēus*?

A. It *arises* from the spinous processes of the four or five superior dorsal, and the three inferior cervical vertebrae, and from the ligamentum nuchae; and descending obliquely, it is *inserted* into the whole length of the base of the scapula; which it draws upwards and backwards.

Q. What are the origin, insertion, and use of the *Longissimus dorsi*?

A. It *arises*, in common, with the sacro-lumbalis from the side of the os sacrum, and all its spinous processes, from the posterior part of the spine of the ilium, and from all the spinous and transverse processes of the lum-

bar vertebrae; their common head fills the space between the ilium and sacrum, and also the hollow of the loins, and that between the spine and angles of the ribs; and it is *inserted* into the transverse processes of all the dorsal vertebrae, and into the lower edge of each of the ribs near their tubercles; the two inferior ribs excepted; it extends the trunk and depresses the ribs.

Q. Describe the *Spinalis dorsi?*

A. It *arises* by five tendinous slips from the spinous processes of the two upper lumbar, and three lower dorsal vertebrae; it ascends incorporated with the longissimus dorsi, and is *inserted* into the spinous processes of the eight uppermost dorsal vertebrae, except the first, by as many tendons; it extends and keeps the trunk erect.

Q. What are the origin, insertion, and use of the *Semi-spinalis dorsi?*

A. It *arises* by distinct tendons from the transverse processes of the seventh, eighth, ninth, and tenth dorsal vertebrae, and is *inserted* into the spinous processes of the six or seven uppermost dorsal, and two lowest cervical vertebrae by as many tendons; it also extends the spine, and keeps it erect.

Q. Describe the *Multifidus spinae?*

A. It *arises* from the side and spinous processes of the os sacrum, and posterior part of the ilium, from all the oblique and transverse processes of the lumbar vertebrae, from all the transverse processes of the dorsal, and of the four inferior cervical vertebrae, by as many distinct tendons; and is *inserted* by distinct tendons into all the spinous processes of the lumbar, dorsal, and cervical vertebrae; it extends the spine obliquely to a side, or with its fellow, directly backwards.

Q. What muscles, besides those already mentioned, are situated on the ANTERIOR and LATERAL PARTS OF THE THORAX?

A. The subclavius, serratus magnus, the inter-costales externi, and interni, and sterno-costalis.

Q. Describe the origin and insertion of the *Subclavius?*

A. It *arises* tendinous from the cartilage which joins the first rib to the sternum, and is *inserted* into the inferior part of the clavicle as far laterad as the coracoid process of the scapula.

Q. Describe the origin, insertion, and use of the *Serratus magnus?*

A. It *arises* from the nine superior ribs by an equal number of fleshy digitations, runs up and backwards, and is *inserted* into the whole length of the base of the scapula; it pulls the scapula downwards and forwards, or this being fixed, it elevates the ribs.

Q. Describe the *Inter-costales externi?*

A. The fibres of the external intercostals *arise* from the inferior edge of each rib, excepting the twelfth, run obliquely down and forwards from the spine to the cartilage, from which to the sternum a membrane is extended; and are *inserted* into the upper edge of each rib immediately below.

Q. What are the origin, direction, and insertion of the *Inter-costales interni?*

A. The internal intercostals *arise* from the inferior margin also of the same ribs, beginning at the sternum, run backwards and downwards, decussating the former muscles, as far as the angle of the ribs where they cease; they are *inserted* into the upper edge of the inferior rib.

Q. What is the use of the Intercostal muscles.

A. The external and internal contract their fibres at the same time, and elevate the ribs in the diagonal of their forces; by which they enlarge the cavity of the thorax.

Q. Describe the *Sterno-costalis*, or *Triangularis?*

A. It *arises* from the edges of the Cartilago ensiformis, and sternum near it, within the thorax, and directing its fibres upwards and outwards behind the cartilages of the ribs, is inserted into the cartilages of the third, fourth, and fifth ribs, by as many angular terminations.

Q. What muscles situated on the POSTERIOR PART OF THE TRUNK ARE ATTACHED TO THE RIBS?

A. The serratus posticus superior, serratus posticus

inferior, sacro-lumbalis, longissimus dorsi, and quadratus lumborum.

Q. Describe the origin, insertion, and action of the *Serrātus postīcus superior?*

A. It *arises* by a broad thin tendon from the ligamentum nuchae at the three inferior cervical, and two superior dorsal spinous processes, running obliquely downwards; is *inserted* by four fleshy slips into the second, third, fourth, and fifth ribs under the scapula; it elevates the ribs, and dilates the thorax.

Q. Describe the *Serrātus postīcus inferior?*

A. It *arises* by a common tendon with the latissimus dorsi from the spinous processes of the two inferior dorsal, and three superior lumbar vertebrae; and is *inserted* by four fleshy slips into the lower edges of the four inferior ribs, near their cartilages; it depresses the ribs, and diminishes the cavity of the thorax.

Q. What are the origin, insertion, and use of the *Sacro-lumbālis?*

A. It *arises* in common with the longissimus dorsi, tendinous without and fleshy within, from the side and spinous processes of the os-sacrum, from the posterior part of the spine of the ilium, and from all the spinous and transverse processes of the lumbar vertebrae; at the last rib it sends off flat tendons, which are *inserted* into the angles of all the ribs, increasing in length as they ascend; it assists in keeping the trunk erect, and in depressing the ribs.

Q. What did you say was the termination of the *Longissimus dorsi?*

A. It is *inserted* by a tendinous and fleshy slip into the inferior part of all the ribs, except the two lowest, between their tubercle and angle; and also into all the dorsal transverse processes by double tendons.

Q. Describe the origin, insertion, and use of the *Quadrātus lumbōrum?*

A. It *arises* broad, tendinous, and fleshy from the posterior half of the spine of the os ilium, and from the superior transverse ligament of the pelvis, extending between the ilium and the transverse process of the last

lumbar vertebra; and is *inserted* into the transverse processes of all the lumbar vertebrae, into the lowest rib near the spine, and into the side of the last dorsal vertebra by a small tendon; it draws the loins to one side, depresses the rib, and with its fellow bends the loins forwards.

Q. What muscles are ATTACHED TO THE RIBS TOWARDS THE ABDŌMEN?

A. The abdominal muscles, being four on each side; the obliquus descendens externus, obliquus ascendens internus, the transversālis, and rectus.

Q. Describe the origin and insertion of the *Obliquus Descendens externus?*

A. It *arises* by seven or eight fleshy slips from the lower margin of the eight inferior ribs near their cartilages, and from the spine of the os ilium; its fibres run downwards and forwards, and terminate in a thin broad tendon, whose fibres are continued in the same direction over the fore part of the abdomen, to its middle line, called *linea alba;* and it is *inserted* into its fellow of the opposite side, during the whole length of the linea alba, extending from the cartilago ensiformis to the os pubis.

Q. Describe the under part of the tendon of the *Obliquus Descendens externus?*

A. The tendon becomes thicker and stronger near its under part, where it *extends* from the superior anterior spinous process of the ilium over the flexor muscles, great blood-vessels and nerves of the thigh, to its *insertion* into the symphysis and angle of the os pubis. This part of the tendon has been termed POUPART'S, or FALLOPIUS', or *inguinal* ligament; as it is not so tense below, it forms a curve behind over the vessels, and is frequently called the *crural arch.*

Q. What forms the *Linea alba?*

A. The junction of the tendons of the muscles of the opposite sides; it is broadest at the umbilīcus, and decreases in breadth towards its extremities at the cartilāgo ensiformis, and symphysis pubis.

Q. What forms the *Linea semilunaris?*

A. It is formed by the tendons of the external and internal oblique and transversalis uniting at the edge of the rectus muscle.

Q. What forms the *Lineae transversae* ?

A. These are three, or sometimes four, in number, running across from the linea semilunaris to the linea alba, and are formed by the tendinous intersections of the rectus muscle on each side, shining through their sheaths.

Q. What are the origins and insertions of the *Obliquus Ascendens internus* ?

A. It *arises* from the back part of the os sacrum, from the spinous processes of the three lowest lumbar vertebrae by a tendon common to it, and the serratus posticus inferior, from the whole spine of the ilium, and from the inside of Poupart's ligament: at the middle of which it sends off a fasciculus of fibres to form the Cremaster muscle. Its fibres run in a radiated manner; those originating from the back run obliquely upwards, and are *inserted* into the cartilages of all the false ribs, and ensiform cartilage; the fibres from the spine of the ilium run more transversely, and become tendinous at the linea semilunaris, where it *is divided* into two layers; the *anterior* adhering firmly to the tendon of the external oblique, runs over the Rectus, and is *inserted* into the whole length of the linea alba: the *posterior layer*, thinner than the former, adheres to the tendon of the transversalis, runs behind the rectus, and is *inserted* into the linea alba; but about half way between the umbilicus and os pubis, this posterior layer ceases, and the whole tendon passes before the rectus; the inferior edge of it extends in nearly a straight line over, or before the spermatic cord, and is *inserted* into the angle of the pubis.

Q. What are the *uses* of the external and internal Oblique muscles?

A. Their fibres are disposed so as to decussate each other; when both on one side act, they draw the trunk obliquely to one side; when those on both sides act at the same time, they bring the trunk directly forwards in

the diagonal of their forces; while they pull down the ribs, diminish the capacity of the thorax, and compress the viscera of the abdōmen.

Q. Describe the origins and insertions of the *Transversalis abdominis?*

A. It *arises* tendinous, but soon becomes fleshy, from the inner surface of the cartilages of the six or seven lower ribs, where it intermixes with the fibres of the diaphragm and intercostals; from the transverse processes of the last dorsal, and four superior lumbar vertebrae; from the whole inner edge of the spine of the ilium, and from the inner surface of Poupart's ligament. At the linea semilunaris, its tendon adhering to the posterior layer of the internal oblique, passes behind the rectus, and is *inserted* into the ensiform cartilage and whole length of the linea alba. In the middle between the umbilicus and os pubis, a slit is formed in the tendon of the transversalis, through which the rectus muscle passes, and between this and the pubis the whole of the tendon of the transversalis passes before, or on the outside of the rectus to its insertion in the linea alba.

Q. What is the *use* of the transversalis abdominis?

A. It, together with its fellow, supports and compresses the abdominal viscera.

Q. What lies within the Transversalis muscles?

A. Its anterior surface is lined by the peritonēum.

Q. Is there not a *fascia* between it and the peritonēum?

A. Yes; the *Fascia Transversalis* arising from the crural arch, and from the under part of a tendinous expansion reflected over the iliacus internus, ascends between the tendon of the transversalis and peritonēum, adhering firmly to both, nearly as high as the umbilicus; it is strong below, and becomes gradually thinner in its ascent.

Q. Is there any *Aperture* through the *fascia transversalis?*

A. Yes; its fibres form a *slit* about half-way between the spine of the ilium and symphysis pubis, through which the spermatic cord, or round ligament, passes;

this slit is the internal abdominal ring, or upper abdominal aperture, which is about an inch in the direction of the anterior superior spinous process above the under abdominal aperture, or external ring.

Q. Is there any other *fascia* connected with the transversalis muscle?

A. Yes; a *tendinous aponeurōsis arising* from the inside of the crural arch, being firmly interwoven with the fibres of the fascia transversalis, and from the spine of the ilium, is reflected upwards over the Iliacus internus and Psoas magnus, which it binds down and protects.

Q. Describe the *Rectus abdōmĭnis?*

A. It *arises* by a flat tendon from the fore and upper part of the os pubis, soon becomes fleshy, and flat, ascends parallel to the linea alba, and is *inserted* into the cartilages of the three inferior true ribs, and extremity of the sternum; and it often intermixes with the under edge of the pectoralis major. In its course, it has three or four tendinous intersections, where its anterior surface adheres firmly to its sheath; one intersection at the umbilicus, a second where it runs over the cartilage of the seventh rib, and a third in the middle between these, and it has commonly a half-intersection below the umbilicus; these form the *lineae transversae.*

Q. What other muscle is connected with the abdominal?

A. The *Pyramidalis*, which is often awanting, *arises* from the symphysis pubis, ascends between the rectus and linea alba in the sheath of the rectus, and *terminates* in the linea alba and inner edge of the rectus, nearly half way to the umbilicus.

Q. What muscle separates the abdomen from the thorax?

A. The Diaphragm, which is commonly described in two portions, called the *superior* and *inferior* muscles of the diaphragm.

Q. Describe the origin and insertion of the *Superior* or *greater muscle* of the *Diaphragm?*

A. It *arises* by distinct fleshy indentations from the

ensiform cartilage, from the cartilages of the seventh, and of all the inferior ribs on both sides: its fibres run in a radiated manner, and are *inserted* into a cordiform tendon, situated in the middle of the diaphragm, and in which the fibres of the opposite sides are interlaced.

Q. Describe the *Inferior,* or *smaller muscle* of the *Diaphragm?*

A. It *arises* by four pairs of heads, of which one pair in the middle, called its tendinous crura, are the longest. They arise from the fore part of the fourth lumbar vertebra, and adhere to the bodies of those of the loins above this; in their ascent they leave an oval opening for the passage of the Aorta, and Thoracic Duct. The other heads arise from the third and second lumbar vertebrae, and are placed more laterally. From these different heads, the fleshy fibres run upwards, and in the middle form two fleshy columns, or crura, which decussate and leave an opening for the Œsophăgus, and is *inserted* by strong fleshy fibres into the posterior edge of the middle, or cordiform tendon.

Q. What is the *situation of the Diaphragm* in expiration and inspiration?

A. The diaphragm is placed obliquely with its anterior part as high as the sternum, while its posterior crura are much farther down; it is convex towards the thorax, and its middle part reaches as high within it as the fourth pair of true ribs; it is concave below. During expiration it is relaxed, and rises up into the thorax; during inspiration, its fibres contract, and bring it down nearly to a plane towards the abdomen.

Q. What are the *uses* of the diaphragm?

A. It forms a complete septum between the thorax and abdomen; in expiration, the abdominal and other muscles depress the ribs, and compress the intestines, which are pushed upwards against the diaphragm, which being relaxed, yields before them, and rises into the thorax: in inspiration other muscles raise the ribs, during which the diaphragm contracts its fibres, and descends nearly to a plane surface. The diaphragm is usually the antagonist of the abdominal muscles; but it acts along

with them in vomiting, and in expelling the faeces; and the foetus in parturition.

Q. What *perforations* are observable *in the diaphragm?*

A. *Three;* one large triangular hole in the cordiform tendon, with its margin near to the mesial line, and its diameter towards the right side, for the passage of the *Vena Cava* inferior: between the long or tendinous crura, there is a large oval hole, through which the *Aorta* and *Thoracic Duct* pass: a little above, rather before the perforation for the aorta, and somewhat to the left side of the mesial line, there is a third hole for the *Œsophăgus* formed by the decussations of the fleshy columns of the smaller muscle of the diaphragm.

Q. What organs are attached to the diaphragm below?

A. The *liver* adheres firmly to its cordiform tendon on the right side of the hole for the passage of the vena cava; and, excepting at this attachment, the whole of its inferior surface is covered by the *peritonēum.*

Q. What parts are attached to the superior surface of the diaphragm?

A. The inferior end of the Mediastīnum is attached nearly to its middle, but rather inclined to the left side of the cordiform tendon; the Pericardium too is attached to its left side; the Pleura covers its fleshy convexities on both sides of the mediastīnum.

Q. What *muscles dilate* or *enlarge* the *thorax?*

A. The intercostales, together with those fibres which pass over the ribs, termed supra and infra-costales, and diaphragm, usually act in the inspirations; but when respiration is rendered difficult, the serrāti postici superiores, the serrati magni, the pectorales, the latissimi dorsi, the scalēni, and sterno-mastoidei, assist in elevating the ribs, when the head is fixed, and the scapulae are raised during inspiration.

Q. What *muscles depress the ribs*, and diminish the capacity of the thorax in expiration?

A. The sterno-costales, recti, oblīqui externi, and interni abdominis, and transversāles, in common act in expirations: but in difficult respiration the serrati postici inferiores, longissimi dorsi, sacro-lumbales, serrati magni, and quadrati lumborum, assist the former.

Q. What other *muscles arise* WITHIN THE ABDOMEN?

A. Three pairs; the psoas parvus, psoas magnus, and iliăcus internus, on each side.

Q. Describe the origin, insertion, and use of the *Psoas parvus?*

A. It *arises* fleshy from the sides of the last dorsal, first and second lumbar vertebrae, sends down a slender tendon, which, running on the inner side of the psoas magnus, is *inserted* thin and flat into the brim of the pelvis at the junction of the ilium and pubis. This muscle is sometimes wanting.

Q. Describe the origin, insertion, and use of the *Psoas magnus?*

A. It *arises* fleshy from the side of the bodies, and transverse processes of the last dorsal, and of all the lumbar vertebrae by as many slips, which uniting, form a thick strong muscle, that bounds the upper part of the side of the pelvis; it passes down over the os pubis under POUPART's ligament, and is *inserted* into the trochanter minor and upper part of the os femoris; both the psoae bend the loins forwards, and this last bends the thigh forwards, and turns the toes outwards.

Q. Describe the origin, insertion, and use of the *Iliăcus internus?*

A. It *arises* fleshy from the transverse process of the last lumbar vertebrae, and from the inner edge of the spine and downwards, and from most of the hollow part of the os ilium, and from an aponeurosis covering it, which is sent up from the inner side of Poupart's ligament and spine of the ilium; it joins the psoas magnus, where it becomes tendinous on the pubis, and is *inserted* along with it into the trochanter minor, and body of the os femoris immediately below it; it assists in bending the thigh, and rotating it outwards.

SURGICAL PATHOLOGY OF THE GROIN.

Q. Describe the *formation* of the *External Abdominal Ring?*

A. The inguinal ligament of the external oblique extending from the superior anterior spinous process of the ilium to the pubis, is separated into an upper and under column or pillar, about two inches from the symphysis pubis: the upper slip, which forms the upper column, goes directly to the symphysis pubis, and even beyond it, where it is inserted: the lower slip, which forms the under column or pillar, turns, or is twisted inwards behind, gets under the upper one, and is inserted into the os pubis within and behind the upper pillar: the inferior edge of the lower column being a little loose, forms an arch over the muscles and vessels, commonly called the *crural arch.*

Q. Is the Aperture formed in the ligament like a Ring?

A. It is a slit of a triangular form, with its base towards the pubis, of an inch in length, terminated at each end by transverse tendinous fibres; the more the external oblique and abdominal muscles are stretched, the closer do the columns of the aperture approach.

Q. Where does the *Internal Abdominal Aperture* commence?

A. On the internal surface, about an inch upwards and outwards, nearer the spinous process of the ilium than the external aperture; the peritonēum exhibits a slight depression where the spermatic cord enters.

Q. What forms the internal and upper aperture?

A. The fibres of the *Fascia Transversalis*, which arises from the posterior edge of the inguinal ligament, and ascends between the transversus muscle and the peritonēum for four or five inches, are separated, and an opening formed to admit the spermatic cord in the male, and the round ligament of the uterus in the female.

Q. Describe the *Inguinal Canal* between the internal and external apertures?

A. The internal aperture is through the fascia trans-

versalis, which at this part has the obliquus internus and transversalis muscles exterior to it, or is covered by them; the canal passes downwards and inwards towards the pubes, over the fascia covering the iliacus internus; at first, having the fascia transversalis and peritonēum within, and the transversalis, internal, and external oblique muscles without; then, having passed down on the surface of the psoas and iliacus internus about half an inch, the canal gets under the lower edge of the transversalis and obliquus internus, has their edge for its superior margin; the fascia transversalis and peritonēum between it and the abdomen, and the inguinal ligament between it and the integuments; and lastly, the canal descends to the external aperture, where it has the united tendon of the transversalis and obliquus internus muscles, and the fascia transversalis behind, or between it and the abdomen. The whole of this inguinal canal is about an inch in length.

Q. How is the junction of the transversalis and obliquus internus above without, and below within the inguinal canal?

A. They decussate each other; the lower margin of these muscles arises from the upper half of POUPART'S ligament, and is inserted into the pubes behind the external ring; and, of course, runs directly transverse; while the inguinal canal runs winding like an italic *f* somewhat twisted downwards, towards the pubes, and forewards; and crossing the inferior edge of the muscles, gets before them, at the external aperture.

Q. What does the *Spermatic Cord* consist of, and how does it direct its course?

A. The spermatic artery, vein, and nerves, involved in cellular membrane, form the cord placed behind the peritonēum, it descends from the loins over the surface of the psoas and iliacus internus, adhering to them by loose cellular substance, comes to the internal aperture, where the Vas Deferens, arising by the side of the pelvis from the neck of the bladder, is added to the cord, which makes a sudden bend into the aperture of the canal; about the middle of the canal, when passing under the

fleshy margin of the transversalis and obliquus internus, it receives a fasciculus of muscular fibres, which form the Cremaster muscle, by which the cord is enlarged, and passing down it comes out by the external aperture, and descends into the scrotum.

Q. What fixes the Spermatic Cord in the canal?

A. The parts composing the cord are connected together by cellular substance, which also fixes it to the margin of the apertures, and to the canal through which it passes, and fills up the whole space around it.

Q. When *Hernia* is protruded by the external inguinal aperture, how is the *sac situated?*

A. The *Sac* is situated above the spermatic cord, at its entrance into the internal aperture; and before it at its exit from the external aperture.

Q. How is the *Hernial Sac* situated with respect to the cremaster muscle?

A. The *Cremaster* muscle, arising from the under edge of the obliquus internus, surrounds the cord, is inserted into the outer surface of the tunica vaginalis testis, and partly into the cellular substance of the scrotum; and, as the hernial sac insinuates itself at the upper aperture between the tunica vaginalis and the cord, it, of course, has both the tunica vaginalis, and the cremaster, spread upon its outer surface, surrounding, and external to, the Sac.

Q. In Hernia of long standing, do the inner and outer apertures of the ring change their relative situations?

A. Yes; the external aperture is fixed, and remains always in the same situation; but the internal is more lax, dilates, yields to the distending power of the hernial sac, and is, by degrees, brought down nearly opposite to the external aperture.

Q. Have the goodness to enumerate the *parts that lie under the* CRURAL ARCH?

A. Under it the psoas magnus, and iliacus internus muscles, the external iliac artery, and the anterior crural nerve with some small branches, pass out; the large fe-

moral vein, and trunks of the lymphatics of the leg, pass under it in their course into the abdōmen.

Q. How do these organs lie with respect to each other under the crural arch?

A. The great femoral vein lies nearest to the os pubis; the great external iliac, or rather femoral artery, lies close by its outer side; and the large anterior crural nerve lies the outermost or most lateral; the iliacus internus and psoas, united here, partly lie under the artery and nerve, and partly occupy the outer half of the space under the crural arch.

Q. Are these parts enclosed by any membrane or sheath?

A. Yes; they are enveloped in cellular substance, in the same manner as vessels are in other parts of the body: and, besides, the psoas parvus sends down an aponeurosis, which covers the psoas magnus and iliacus internus, and descends behind the large vessels, through the external aperture, and has been named the *fascia iliaca*, which is firmly attached to the pubal fascia lata, and forms part of the crural sheath; the external portion of the fascia lata, arising from the inguinal ligament, between the spine of the ilium and the inner side of the femoral vein, covers the vessels just below the crural arch: the internal or pubal portion passes behind the femoral vessels, which lie between these portions of the fascia lata in an oval depression. Besides, superficial fascia descending from the abdomen covers all these, and interlaces them together.

Q. What part of the crural arch is most favourable for the *descent of Hernia*?

A. Between the great vein and the insertion of the under column of the inguinal ligament into the pubes, there is a triangular space, occupied by cellular substance, fat, and lymphatic vessels, through which Femoral Hernia protrudes.

Q. Whether are males, or females most liable to Femoral Hernia, and why?

A. Females are most subject to femoral hernia; because the dimensions of their pelvis are greater than

those of the male pelvis; hence the extent of the inguinal ligament is longer, and the triangular space between the external iliac vein and the pubes is larger; in consequence, their predisposition to Hernia must be greater.

Q. Describe these different parts in the *order of dissection?*

A. Under the common integuments are cellular substance, lymphatic glands, superficial veins, and nerves, and the superficial fascia, which covers the obliquus externus, the groin, and the upper and fore part of the thigh; it consists of several layers of cellular membrane, which at the bend of the thigh separate and include the superficial inguinal glands and fatty matter; it descends over the spermatic cord, adhering to the tunica vaginalis, and to the crural arch, and covers the large vessels below the arch.

Q. When this superficial fascia is carefully removed, what parts come into view?

A. We find the *superficial fascia* intimately connected with the parts below by loose cellular tissue, in which lie the deep seated lymphatic or inguinal glands, the large vena saphēna, and small nerves; under all which is the fascia lata, very thick and strong on the outside of the thigh, but becoming much thinner on the inside near to the crural arch.

Q. Does the *Fascia Lata* cover the crural arch and large vessels emerging from under it?

A. The external portion of the fascia lata covers the sartorius and rectus femoris muscles, and is attached to POUPART's ligament from the anterior superior spine of the ilium, to the inner side of the femoral vein; as we said before, it covers the crural arch, forming a lunated margin with its end at the pubes, and proceeding downwards, called the semilunar or crescent-shaped fold, or falciform process; the superior end of this crescent portion of the fascia lata is in front of, and covers the femoral artery and part of the vein, just below the crural arch; the vena saphēna major passes over the falciform edge of the ilial fascia, and terminates in that

part of the femoral vein uncovered; the pubal portion of the fascia lata covers the pectinalis, and triceps adductor muscles, next the os pubis, and passing behind the femoral vessels, is inserted into the iliac fascia and os pubis; and a little below the termination of the vena saphēna, it is united to the ilial portion.

Q. Where is the *Hernial Sac* situated in respect to the parts just mentioned?

A. The hernial sac always descends through the crural arch at the inner or pubal side of the femoral vein; and lies in the hollow on the external surface of the fascia lata, in front of the pectinālis muscle, and as the tumour increases in bulk, its fundus rises on the falciform portion of the fascia lata, and even upwards over the crural arch.

Q. What MUSCLES are connected with the ORGANS OF GENERATION in the male?

A. *Four* muscles on each side; namely, the cremaster, erector penis, accelerator urinae vel ejaculator seminis, and the transversus perinēi.

Q. Describe the origin, insertion, and use of the *Cremaster*?

A. This muscle, as we have already observed, *arises* from the under fleshy edge of the obliquus internus, surrounds the spermatic cord, passes with it through the ring of the external oblique, and stretching down to the testicle, is *inserted* into the external surface of the tunica vaginalis testis, and cellular substance of the scrotum; in coitu it elevates and compresses the testicle, and assists in evacuating its contents.

Q. What are the origin, insertion, and use of the *Erector penis*?

A. It *arises* from the inner side of the tuberosity of the ischium, ascends increasing in breadth, and embraces the whole crus penis; and is *inserted* by a thin tendon into the strong tendinous membrane, which covers the corpora cavernosa penis as far as the union of the crura: it compresses the crus, by which the blood is propelled into the fore part of the corpora cavernosa,

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and the penis thereby is more completely distended; and with its fellow keeps the penis in its proper direction.

Q. Describe the origin, insertion, and use of the *Accelerator urinae?*

A. It *arises* fleshy from the sphincter ani, and membranous part of the urethra, and tendinous from the crus and beginning of the corpus cavernosum penis; its fibres run obliquely transverse, and are *inserted* into its fellow by a tendinous middle longitudinal line, they cover the whole bulb of the urethra; it propels the urine and semen forwards.

Q. Describe the origin, insertion, and use of the *Transversus perinĕi?*

A. It *arises* from the inside of the tuberosity of the ischium, runs transversely, and is *inserted* into the back part of the accelerator urinae, and adjoining part of the sphincter ani; it dilates the bulb of the urethra, prevents the anus from being too much protruded, and retracts it after the discharge of faeces.

Q. What muscles are peculiar to the FEMALE ORGANS of *gĕneration?*

A. *Three;* namely, the erector clitorĭdis on each side, and the sphincter vaginae.

Q. Describe the origin, insertion, and use of the *Erector clitorĭdis?*

A. It *arises* from the inside of the tuber and ramus ischii, and ramus pubis, ascends and covers the crus of the clitŏris; and is *inserted* into its upper part, and into the body of the clitŏris; it and its fellow draw the clitŏris downwards and backwards, compress its crura, and propel the blood into its body; by which it is rendered more tense and erect.

Q. Desciibe the *Sphincter Vagīnae?*

A. It *arises* from the sphincter ani, and posterior part of the vagīna near the perinēum, and thence runs round the sides of the vagina near its orifice, covers the corpora cavernosa vaginae, and is *inserted* into the union of the crura clitorĭdis; it contracts the orifice of the vagina.

Q. What *muscles* are connected with the ANUS?

A. The sphincter and one on each side, viz. the levator ani.

Q. Describe the *Sphincter Ani*?

A. It *arises* from the extremity of the os coccygis, and skin and fat around the anus, forms a flat oval muscle, which surrounds the extremity of the intestinum rectum, and is *inserted* by a narrow tendinous point into the accelerātōres urīnae, and transversi perinei; it shuts the anus, and also pulls down the bulb of the urethra, and assists in ejecting the urine and semen.

Q. Describe the origin, insertion, and use of the *Levator ani*?

A. It *arises* from the inside of the os pubis at the upper edge of the foramen thyoidēum, from the aponeurosis covering the obturātor internus and coccygēus, and from the spinous process of the os ischium; from these circular origins its fibres descend, as radii to a centre, to meet its fellow, and are *inserted* into the sphĭncter ani, accelerātor urinae, and under and fore part of the os coccygis; it and its fellow surround the neck of the bladder, prostrate gland, part of the vesicŭlae semināles, and the whole extremity of the rectum, representing the shape of a funnel: it and its fellow support the contents of the pelvis, draw the rectum upwards after the evacuation of faeces, assist in shutting it, in ejecting the urine and semen, and even faeces; and, as it appears to some Anatomists, they compress the veins, and assist in the distention and erection of the penis.

Q. What *muscles* are connected with the OS COCCYGIS?

A. *One* on each side, namely, the coccygēus.

Q. Describe the origin, insertion, and use of the *Coccygēus*?

A. It *arises* from the spinous process of the os ischii, becomes broader, covers the inside of the posterior sacro-ischiatic ligament, and is *inserted* into the extremity of the os sacrum, and nearly into the whole length of the side of the os coccygis; it draws the coccyx for-

wards, and assists the levator ani in raising and supporting the end of the rectum.

Q. What *muscles* are employed in the MOVEMENTS OF THE THIGH?

A. Their number is *twenty-three*, or, by considering the triceps adductor three distinct muscles, *twenty-six*.

Q. Enumerate the muscles connected with, or arising from, the FORE PART OF THE PELVIS, and *inserted* into the OS FEMORIS?

A. They are eight in number, supposing the triceps, three distinct muscles, namely, the tensor vaginae femoris, psoas magnus, iliacus internus, pectinalis, triceps adductor femoris divided into the adductor longus, brevis, and magnus, and the obturator externus.

Q. Describe the origin, insertion, and use of the *Tensor vagīnae femŏris*?

A. It *arises* from the external part of the anterior superior spinous process of the ilium, runs down and backwards, becoming fleshy, inclosed in a doubling of the aponeurosis forming the vagina, and is *inserted* into the inner surface of the fascia lata, a little below the trochanter major; it stretches the fascia, assists in abduction, and in rotation inwards or tibiad.

Q. Having formerly described the Psoas magnus, and Iliacus internus; mention the origin, insertion, and use of the *Pectinālis*?

A. It *arises* broad and fleshy from the upper and forepart of the os pubis, just above the foramen thyroidēum, runs down and outwards at the inner side of the psoas magnus, and is *inserted* by a short flat tendon into the linea aspĕra, immediately below the trochanter minor; it bends the thigh upwards and inwards, rotating it outwards.

Q. Describe the *Triceps adductor femoris*?

A. This muscle is generally described under three distinct heads. The *Adductor longus femoris arises* by a tendon from the upper and fore-part of the os pubis, near the symphysis, at the inner side of the pectinalis, and is *inserted* into the middle of the linea aspera, by a broad flat tendon.

Q. Describe the second head of the triceps, the *Adductor brevis ?*

A. It *arises* tendinous from the pubes at the side of its symphysis below the former, runs obliquely outwards, and is *inserted* by a short flat tendon into the linea aspera between the trochanter minor and the insertion of the former.

Q. Describe the origin, insertion, and use of the *Adductor magnus ?*

A. It *arises* from the side of the symphysis pubis below the former, and downwards from the ramus of the pubes, the ramus and tuberosity of the os ischium, its fibres run outwards and downwards spreading wide, and are *inserted* into the whole length of the linea aspĕra, into the ridge leading to the inner condyle, and by a long round tendon into the upper part of that condyle : these three adductors draw the thigh inwards, and upwards, and rotate it a little outwards.

Q. Describe the *Obturator externus ?*

A. It *arises* by a semicircular margin from the foreparts of the pubes and ischium, composing the anterior half of the foramen thyroidēum, and from the membrane which fills up that foramen ; its fibres are collected as radii to a centre, pass outwards around the back part of the cervix of the os femoris, and it is *inserted* by a strong round tendon into the cavity at the inner and back part of the root of the trochanter major, adhering in its course to the capsular ligament ; it rotates the thigh outwards, and prevents the capsular ligament from being pinched.

Q. What muscles arising from the BACK PART OF THE OS INNOMINATUM are inserted into the FEMUR ?

A. *Seven ;* the glutēus maxĭmus, medius, and minĭmus, pyriformis, gemĭni, obturator internus, and quadratus femŏris.

Q. What are the origin, insertion, and use of the *Glutēus maxĭmus ?*

A. It *arises* fleshy from the back part of the spine of the ilium, from the lateral surface of the sacrum, from the os coccygis, and from the posterior sacro-sciatic li-

gament; its strong fleshy fibres run obliquely forwards and downwards, and converging, form a strong flat tendon, which slides over the posterior part of the trochanter major, and here sends off a quantity of tendinous fibres, which are inseparably connected with the fascia lata; and it is *inserted* by a strong, thick, broad tendon, into the upper and outer part of the linea aspĕra, and partly into the fascia lata: it extends the thigh, draws it outwards, and turns the toes fibulad.

Q. Describe the origin, insertion, and use of the *Glutĕus medius?*

A. It *arises* fleshy from all the spine of the ilium unoccupied by the glutcus maximus, from the upper part of the dorsum of the bone, and from the aponeurosis, which covers this muscle, and joins the fascia of the thigh; its fibres converge into a broad tendon, which is *inserted* into the outer and posterior part of the trochanter major; it draws the thigh outwards, a little backwards, and assists in rotation fibulad.

Q. What are the origin, insertion, and use of the *Glutĕus minĭmus?*

A. It *arises* fleshy from the lower half of the dorsum of the ilium, from a ridge continued from the superior anterior spinous proccss to the great sciatic notch; its fibres converge, like radii, to a flat, strong tendon, which is *inserted* into the fore and upper part of the trochanter major; it assists the former in pulling the thigh outwards, backwards, and in rotating it inwards or tibiad.

Q. Describe the *Pyriformis?*

A. It *arises* within the pelvis by three tendinous and fleshy heads from the second, third, and fourth false vertebrae of the os sacrum, and becoming round and tapering, it passes out of the pelvis along with the sciatic nerve, through the great notch of the ilium, from which it receives some fleshy fibres, and is *inserted* by a roundish tendon into the upper part of the cavity at the inside of the root of the trochanter major; it assists in abduction of the thigh, and in rotation of it outwards or fibulad.

Q. Describe the origin, insertion, and use of the *Gemĭni?*

A. They are two distinct muscles; the superior head *arises* from the spinous process; the inferior one from the tuberosity of the os ischium, and from the anterior surface of the posterior sacro-sciatic ligament, they unite and form a sheath around the tendon of the obturator internus, and is *inserted* into the cavity at the inner side of the root of the trochanter major; they rotate the thigh fibulad or outwards, assist in extension, and prevent the tendon of the obturator internus from starting out of its place.

Q. What are the origin, insertion, and use of the *Obturător internus?*

A. It *arises* within the pelvis by a semicircular fleshy margin from the anterior half circumference of the foramen thyroidēum, and from the obturator ligament; its fibres converge, and send off a flattish round tendon, which passes over the sinuosity between the spine and tuber of the ischium, as a rope over a pulley, goes over the capsular ligament, inclosed in the sheath of the gemini, and is *inserted* into the large pit at the root of the trochanter major; it rotates the thigh outwards, and assists in its extension.

Q. Describe the origin, insertion, and use of the *Quadratus femoris?*

A. It *arises* from the outside of the tuber ischii, runs transversely outwards, and is *inserted* fleshy into the rough ridge between the roots of the greater and smaller trochanter; it rotates the thigh outwards and assists in its extension.

Q. What *muscles arise* from the BONES OF THE PELVIS, and are inserted into *those of the* LEG?

A. *Six* muscles pass along the femur without being attached to it, excepting the short head of the biceps; namely, the sartorius, gracĭlis, rectus femŏris, on the anterior aspect; and the semitendinōsus, semimembranōsus, and biceps flexor cruris on the posterior.

Q. Describe the origin, course, insertion, and use of the *Sartŏrius?*

A. It *arises* tendinous from the superior anterior spinous process of the ilium, becomes fleshy, runs obliquely downwards and inwards upon the rectus, and in a spiral manner over the vastus internus, and about the middle of the thigh over part of the triceps, and descending between the tendon of the adductor magnus and that of the gracilis, behind the inner condyle; it is *inserted* by a broad thin tendon into the inner side of the tibia near the under part of its tubercle; it bends the thigh, but especially the knee-joint, and brings the leg across the other, is a rotator tibiad.

Q. Describe the origin, course, and insortion of the *Gracĭlis?*

A. It *arises* by a thin tendon from the os pubis near its symphysis, and soon becoming fleshy, descends on the inside of the thigh in a direct course, and is *inserted* tendinous into the tibia immediately below the sartorius; it assists in bending the thigh, and drawing it inwards, but it is chiefly a flexor of the knee-joint.

Q. Describe the origin, insertion, and use of the *Rectus femŏris?*

A. It *arises* fleshy from the inferior anterior spinous process of the ilium, and tendinous from its dorsum just above the acetabŭlum, descends directly over the anterior part of the cervix of the femur, along its fore part, increasing in size as far down as its middle, and then decreasing: it has a longitudinal tendon, from which the fleshy fibres run off like the plumage of a feather; it is *inserted* into the upper part of the patella; it assists in bending the thigh, but is chiefly an extensor of the leg.

Q. Does part *of its tendon* not *pass over* the surface of the *patella*, to be inserted into the tibia?

A. Yes; the greater part of the strong flat tendon terminates at the patella; but a strong tendinous aponeurosis is sent over it, and another one under it to be connected with the strong ligament of the patella which is inserted into the upper and fore part of the tibia.

Q. Does the *Patella* seem to perform the office of a *sesamoid bone* to the tendon of the Rectus femŏris?

A. Yes; the bone of the patella, fixed like a sesamoid bone between expansions of the tendinous fibres of the rectus, strengthened by those of the vasti muscles on each side, plays in the anterior and inferior depression between the condyles of the femur, as a rope over a pulley, in the motions of the knee-joint: hence it may be said that the rectus femoris terminates in the tibia.

Q. Describe the origin, course, insertion, and use of the *Semitendinōsus?*

A. It *arises*, in common with the long head of the biceps, from the posterior part of the tuberosity of the ischium; its fleshy belly runs down superficially between the biceps and gracilis, on the back part of the thigh, and sends off a long roundish tendon, which passes by the inner side of the knee, and becoming flat, is *inserted* into the inside of the tibia, a little below its tubercle; it assists in extending the thigh, but is chiefly a flexor of the knee-joint, and a rotator of the thigh inwards.

Q. Describe the origin, course, insertion, and use of the *Semimembranōsus?*

A. It *arises* by a broad flat tendon from the upper and back part of the tuberosity of the ischium, becomes fleshy, with its fibres running obliquely towards a tendon at its inner side, runs at first on the fore part of the biceps, and then lower down between it and the semitendinosus, and is *inserted* tendinous into the inner and back part of the head of the tibia; it assists in extending the thigh, but chiefly is a flexor of the knee-joint.

Q. Describe the origin, course, insertion, and use of the *Biceps flexor crūris?*

A. It *arises* by two distinct heads, the long one *arises* in common with the semitendinosus by a short tendon from the upper and back part of the tuberosity of the ischium, runs just under the fascia between the vastus externus and semitendinosus; the short head *arises* fleshy from the linea aspera just below the insertion of the glutēus maximus, becomes broader, and joins

the long head a little above the external condyle; their fleshy belly sends off a strong tendon, which is *inserted* into the upper part of the head of the fibula; its long head assists in extending the thigh; but it is chiefly a flexor of the knee-joint, and slightly an adductor, and rotator outwards.

Q. Which of these muscles by their tendons forms the internal, and which the external *hamstrings?*

A. The tendons of the semitendinosus, and semimembranosus chiefly; and the tendons of the sartorius and gracilis also, form the inner hamstring: and the tendon of the biceps alone forms the outer one.

SURGICAL PATHOLOGY OF THE HIP AND THIGH.

Q. What *muscles bend the thigh?*

A. The *flexion* of the hip-joint is performed by the combined action of *eleven muscles*, namely, the tensor vagīnae, sartorius, gracilis, pectinalis, adductor longus, ad. brevis, ad. magnus, iliacus internus, psoas magnus, obturator externus, and the gluteus minimus; all of which are also adductors, or abductors, and rotators.

Q. What *muscles extend the thigh?*

A. Extension is also performed by the combined action of *ten muscles*, viz. the gluteus maximus, part of the gluteus medius, pyriformis, obturator internus, gemini, quadratus femoris, part of the adductor magnus, long head of the biceps, semitendinosus, and semimembranosus: of which the first five are also abductors, and rotators of the toes fibulad, or outwards; the last five are also adductors and rotators fibulad; the two last of them, however, have very little rotatory power.

Q. What muscles are *adductors*, or pull the one thigh towards the other?

A. *Adduction* is performed by the combined action of *twelve muscles*, namely, the pectinalis, adductor longus, ad. brevis, ad. magnus, quadratus femoris, gracilis, semitendinosus, semimembranosus, long head of the biceps, obturator externus, psoas magnus, and iliacus internus; of which all are besides either flexors, or exten-

sors, and nine are also rotators fibulad; and the remaining three, the gracilis, semitendinosus, and semimembranosus, are rather rotators tibiad.

Q. *What muscles* pull the one thigh from the other, or *perform abduction?*

A. *Abduction* of the thigh is effected by the combined action of *eight muscles*, namely, the tensor vaginae, gluteus maxĭmus, g. medius, g. minimus, pyriformis, sartorius, obturātor internus, and gemĭni; of which all are also either flexors, or extensors, and rotators fibulad; except the tensor vagīnae, and sartorius, which rotate tibiad.

Q. *What muscles are rotators* of the toes outwards, or *fibulad?*

A. *Thirteen*, namely, the gluteus maxĭmus, part of the gluteus medius, pyriformis, gemĭni, obturātor internus obturātor externus, quadratus femŏris, iliăcus internus, psoas magnus, adductor longus, ad. brevis, ad. magnus, and biceps in the extended state of the leg; by which various other motions are also performed.

Q. What muscles perform *rotation inwards* or *tibiad?*

A. *Six;* the tensor vaginae, part of the gluteus medius, gluteus minimus; and, in the extended state of the leg, the sartorius, gracĭlis, and semitendinōsus; all of which perform other actions besides rotation.

Q. Can these numerous muscles move the thigh in any other directions?

A. Yes; they co-operate so with one another, that they can move the thigh, and fix it in every possible direction between the four aspects just enumerated; and besides, they can perform combined, alternate, and reciprocal actions, by which the leg, when extended, is moved round, so as to describe the circumference of a cone; the head of the femur being the apex, and the foot the base of the cone described.

Q. Enumerate the means provided for *protecting the hip-joint from luxation?*

A. Within the joint the round ligament attaches the head of the femur to the bottom of the acetabulum; the

deepness of the osseous and cartilaginous brim of the acetabŭlum itself; the double transverse ligament stretched across the notch at its under and anterior part, where it is least exposed; the muscles which lie close upon the circumference of the joint, namely, on the posterior part, the quadratus, the tendons of the obturator externus, of the gemini and obsurator internus, and of the pyriformis in that order of succession from below upwards: on the upper part, the gluteus minimus, and gluteus medius: on the anterior part, the rectus femoris and sartorius: on the inferior part, the tendons of the psoas magnus and iliacus internus, lie close to the capsular ligament: besides these, the gluteus maximus covers all the muscles above and behind, and gives great additional security to the joint.

Q. In consequence of the *hip-joint* being guarded, and secured in that manner, *is it often dislocated?*

A. The strongly formed and guarded state of the hip-joint certainly renders its dislocation difficult; but the freedom of its motions; the superincumbent weight of the body; and the accidents to which it is unavoidably exposed, render it subject to occasional dislocation.

Q. In what ways can the *hip-joint be dislocated?*

A. In *three* different positions; the most frequent is, when the head of the os femoris is forced downwards and forwards on the obturator foramen: the next in frequency is, when the head of the femur is forced upwards and outwards on the dorsum of the os ilium with the trochanter major forwards: the most rare position is, when the head of the femur is forced on the dorsum of the ilium with the trochanter major projecting backwards.

Q. When the *head of the femur* is thrust down *into the foramen thyroidēum* or *obturatōrium*, what muscles are over-stretched?

A. The three glutei, the rectus femoris, psoas magnus, and iliacus internus, are very much over-stretched; the pyriformis, pectinalis, sartorius, and gracilis, are also much upon the stretch; the semitendinosus, semimembranosus, and long head of the biceps, are considerably stretched too.

Q. What *parts seem to be injured* in such a luxation?

A. The capsular ligament of the hip-joint, although naturally wide and roomy, the round ligament within the joint, and the double cartilaginous ligament stretched across the notch on the fore part of the acetabulum, must be ruptured; also various connexions by cellular substance must be destroyed.

Q. In what manner is such a *luxation to be reduced?*

A. By relaxing the muscles most upon the stretch, so as to give them power to act, and by bringing their antagonists into action, the head of the femur may be replaced in the acetabulum with a very small degree of mechanical force.

Q. By what means are the over-stretched muscles to be relaxed?

A. Of these muscles *six* are situated on the anterior aspect, namely, the psoas magnus, iliacus internus, rectus femoris, pectinălis, gracĭlis, and sartorius: and *four* on the posterior aspect of the acetabulum, viz. the three glutēi and pyriformis: and three below, arising from the back of the tuberosity of the ischium, namely, the semitendinosus, semimembranosus, and long head of the biceps. In order that the two first classes of muscles may be relaxed at the same time, the thigh must be raised towards the trunk in the diagonal between flexion and abduction, at first keeping the leg in the same degree of rotation, in which it remained after the injury. After the leg is raised as far as the muscles attached to the ischium will permit, rotation inwards, or tibiad, should be gradually and steadily made in the act of raising it by the Surgeon; while an assistant, with a towel put round the inside of the thigh, below and near to the trochanter minor, should pull steadily outward from the other thigh in the same diagonal aspect, in order to disengage the head of the femur. When the surgeon has raised the limb as far as he can, and rotated it tibiad in the mean time to rather more than its natural position, while the assistant keeps his steady pull, he should bring the leg suddenly, and rather forcibly, if necessary, to a state of complete adduction; during which,

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the combined action of all the muscles of the joint will reduce the head of the femur into the acetabulum?

Q. When the *head of the femur* is forced upwards and outwards *on the dorsum of the ilium* with the trochanter major forwards, what muscles are over-stretched?

A. *Eight muscles* seem to be very much stretched, viz. the obturator externus, obt. internus, gemini, quadratus femoris, and the triceps adductor, composed of three distinct muscles, the adductor longus, add. brevis, and add. magnus.

Q. What *parts* seem to be *injured by the luxation upwards?*

A. The round, and capsular ligaments must be ruptured; part also of the gluteus minimus near to the acetabulum must be torn from the dorsum of the ilium, and the part of it stretched over the head of the femur will be greatly distended.

Q. In what manner can this *luxation upwards* be most *readily reduced?*

A. Attention should first be paid to the situation of the muscles most over-stretched, and the thigh should be brought into a state of close adduction, crossing the other, and half flexion, in order to relax the muscles as much as possible. This being done, an assistant should have a towel put round the inside of the thigh, as near to the trochanter minor as possible, another towel bound round above the condyles of the femur should be given to another assistant, or two; the knee-joint to be bent, so that the leg may be at a right angle. The assistants should be instructed to act at the same time; at a word given by the surgeon, the assistant at the trochanter should pull strongly and steadily outwards, so as to raise and disengage the head of the femur from behind the brim of the acetabulum, while the assistants at the towel fixed above the condyles should pull steadily and strongly in the direction of the femur, which is in a state of great adduction, crossed over the other leg and half flexion, in order to bring down its head over the brim of the acetabulum; the

surgeon himself, in the mean time, using the leg half bent as a lever, should favour the relaxation of the muscles by rotating the thigh outwards, which he must accomplish by repeated progressive attempts, in proportion as the other forces employed by the assistants are in execution. By these means, the muscles most tense are relaxed, and fitted for action, while those relaxed are brought into a condition for acting; the head of the femur, being first brought into a favourable situation by the mechanical forces employed, is ultimately replaced in the acetabulum by the combined natural contraction of the muscles themselves.

Q. When the *head of the femur* is forced up on the *dorsum of the ilium* with the trochanter major backwards, what muscles are over-stretched?

A. The quadratus femoris, obturator externus, gemini, obturator internus, and pyriformis, are greatly distended?

Q. What steps are necessary towards the *reduction* of such a luxation?

A. The patient should be laid upon the opposite side, inclined towards his back; one assistant should have hold of a towel put round the inside of the thigh, to be ready to pull the head of the femur from the dorsum of the ilium at a given word; another towel should be fixed round the thigh above the condyles, and given to two assistants, who should be instructed to make extension in the direction of the femur, also at the word given by the surgeon.

Q. When preparations have been so made, *how is the reduction* of the joint *to be accomplished?*

A. The surgeon having taken his station behind the dislocated limb, and observing that his assistants are all ready, should bend the knee-joint to a right angle, that he may use the leg as a lever, and then should give orders to his assistants to pull in their respective directions; in proportion as the femur is moved from its luxated position, he should rotate the femur outwards, and bring it into adduction at the same time; by which

the muscles, previously too tense, are relaxed; and others, previously too much relaxed, are brought into their sphere of action; by which means, the head of the femur is replaced in the acetabulum.

Q. What *muscles arise* FROM THE BODY *of the femur?*

A. *Three;* the crurālis, vastus externus, and vastus internus.

Q. Describe the origin, course, insertion, and use of the *Crurālis* or *Crurēus?*

A. It *arises* fleshy from between the trochanters, but nearer the minor, and from all the fore-part of the femur to near its under extremity; its sides are connected with the vasti muscles, it lies behind the rectus, and is *inserted* tendinous into the upper part of the patella; it assists in extending the knee-joint.

Q. Describe the *Vastus externus?*

A. It *arises* broad, tendinous, and fleshy, from the outer part of the root of the trochanter major, and downwards along the outer side of the linea aspĕra to near the external condyle, by fleshy fibres, which run obliquely forwards, and are inserted into a middle tendon; this muscle occupies the whole flat external surface of the femur, and is *inserted* into the outer and upper part of the patella; it is joined to the edge of the tendon of the rectus; part of its tendon sends an aponeurosis over the joint, and is firmly attached to the head of the tibia; it assists in extending the leg.

Q. Describe the *Vastus internus?*

A. It *arises* tendinous and fleshy from between the fore and upper part of the os femŏris, and the root of the trochanter minor; and also along the whole inside of the linea aspĕra, by fibres running obliquely forwards; it lies on the flat inside of the bone, and is *inserted* into the inner and upper edge of the patella; and it also sends down an aponeurosis over the inside of the joint, to be attached to the upper part of the tibia; it assists in extending the leg.

Q. Are these large muscles of the thigh quite distinct, or much interlaced with each other?

A. The rectus femoris is pretty distinct, being tendinous behind, where it plays on the cruralis and vasti, but the cruralis and the vasti near their origin seem to form one large fleshy mass on the surface, but deeper, they are distinct; two or three inches above the condyles, they again join into an inseparable mass, whose tendinous expansion, joined to that of the rectus, embraces the patella, and is firmly attached to the head of the tibia.

Q. What *muscles arise* FROM THE CONDYLES of the *os femoris?*

A. *Three;* the poplitēus, gastrocnēmius externus, and plantāris.

Q. Describe the origin, insertion, and use of the *Poplitēus?*

A. It *arises* by a small round tendon from the outer and under part of the external condyle, and from the back part of the capsular ligament, becomes fleshy, spreads out, runs obliquely inwards and downwards, and is *inserted* thin and fleshy into a ridge at the upper and inner edge of the tibia, a little below its head; it assists in flexion, and rotation inwards or tibiad, and prevents the capsular ligament from being pinched in flexion of the joint.

Q. Describe the *Gastrocnēmius externus?*

A. It *arises* by two distinct heads, the one tendinous from the upper and back part of the internal condyle, and from the oblique ridge above it; the other head also tendinous in like manner, from the upper and back part of the external condyle; they meet a little below the joint, and form a large fleshy mass with a middle tendinous line; below the middle of the tibia it sends off a broad thin tendon, which becoming narrower, is united with that of the gastrocnemius internus, a little above the ankle.

Q. Describe the *Plantaris?*

A. It *arises* thin and fleshy from the upper and back part of the external condyle, and from the capsular li-

gament, forms a tapering belly three or four inches in length, which sends down a long slender tendon between the external and internal gastrocnemii; and, where their tendons unite, it passes obliquely over to the inner side of the tendo ACHILLIS, where it descends, and is inserted into the inner and posterior part of the os calcis, below the insertion of the tendo Achillis.

SURGICAL PATHOLOGY OF THE KNEE.

Q. Having now described all the muscles connected with the Knee-joint, describe also the *Internal* or *Crucial Ligaments of it?*

A. There are *two* crucial or internal ligaments; the *anterior*, arising from the semilunar notch between the condyles running obliquely forwards, is inserted into a pit before the rough protuberance in the middle of the articular surface of the head of the tibia; the *posterior*, arising similar to the former, passes behind it, and is inserted behind the protuberance; they attach the femur and tibia firmly together, while they allow the motions of the joint, and rotation tibiad, but not fibulad.

Q. Describe the *Semilunar Cartilages* of the Knee-joint.

A. The head of the tibia is divided by a middle ridge; on each side of which is a cavity, corresponding to the condyles of the femur; each cavity is deepened by a crescent-formed cartilage, thick on the outer convex, and thin on the inner concave side; the circumference of these two cartilages is connected to the capsular ligament; their inner points, or cornua, are connected by a small transverse ligament, and to the middle protuberance of the tibia.

Q. Are the condyles of the femur and the articular surfaces of the tibia covered?

A. Yes; they are all covered by cartilage, and well lubricated for facilitating the motions of the joint.

Q. What muscles are EXTENSORS *of the Knee-joint?*

A. *Six;* the anterior part of the tensor vaginae, and of the glutēus maximus connected with it, the rectus femoris, vastus internus, vastus externus, and cruralis.

Q. What muscles are FLEXORS *of the Knee-joint?*

A. They are *ten;* the posterior part of the tensor vaginae and of the glutēus maximus attached to it, the sartorius, gracilis, semitendinosus, semimembranosus, biceps cruris, gastrocnemius externus, plantaris, and poplitēus.

Q. Has the Knee-joint much *rotatory motion?*

A. No; its motions are chiefly flexion and extension; a slight degree of rotatory motion of the toes tibiad and fibulad can be performed at the knee; but the crucial ligaments check it from going far tibiad.

Q. What is the *use of the* PATELLA or ROTULA under the tendons of the four most powerful extensor muscles?

A. It is lined below by cartilage, and well lubricated; by which means it moves round the cavity between the condyles in flexion and extension with great facility; it removes the tendons farther from the centre of motion, and thus increases their power of action.

Q. Is it ever *fractured* or *dislocated?*

A. Yes; it is occasionally fractured across, when the joint is half bent: it is also sometimes forced out of the hollow pulley between the condyles to one side, generally outwards.

Q. Is the *Knee-joint ever* DISLOCATED?

A. Very seldom; the strong lateral ligaments, the thick capsular, and strong crucial ligaments, the tendinous aponeurosis, and tendons of muscles lying close upon the capsular ligament, prevent its dislocation, unless the force applied be sufficient to rupture some of these strong natural guards and securities, and to displace the joint.

Q. What muscles are EXTENSORS OF THE FOOT?

A. *Eight;* the gastrocnemius externus and plantaris

already described, the gastrocnemius internus, the tibiālis posticus, the peronēus longus, and brevis, the flexor longus digitorum pedis, and the flexor longus pollicis, which two last, though principally flexors of the toes, are also extensors of the foot.

Q. Describe the *Gastrocnēmius internus* vel *Solēus?*

A. It *arises* also by two heads, the external, by much the larger, fleshy from the back part of the head, and upper and back part of the body of the fibula; the internal from the back part of the tibia, running inwards along the under edge of the poplitēus; it receives fleshy fibres from the inner side of the bone for a considerable way down; they unite and form a large belly, which, covered by the tendon of the gastrocnemius externus, descends fleshy and tapering near to the ankle; then it sends off a tendon, which joins that of the former muscle, and their united round tendon, called *tendo* ACHILLIS, is *inserted* in the upper and back part of the os calcis; these two muscles raise the heel, and extend the foot.

Q. Describe the *Tibialis postĭcus?*

A. It *arises* fleshy from the upper and fore part of the tibia, passes through a fissure in the interosseous ligament, and continues its origin from the posterior part of the tibia, fibula, and interosseous ligament, down to their middle; its fibres run obliquely to a middle tendon, which becoming round passes through a groove behind the inner ankle, and is *inserted* by separate tendinous slips into the upper and inner part of the os naviculare, and partly into the under surface of the tarsal bones.

Q. Describe the *Peronēus longus?*

A. It *arises* from the fore part of the head of the fibula, and from its outer part downwards for two thirds of its length; its fibres run in a penniform manner to a long tendon, which becoming round is inclosed in a sheath, passes behind the outer ankle through a groove in the lower extremity of the fibula, is reflected to the sinuosity of the os calcis, runs along a groove in the os

cuboides, and then obliquely across the sole of the foot, and is *inserted* into the outside of the base of the metatarsal bone of the great toe, and partly into the os cuneiforme internum.

Q. Describe the *Peronēus brevis?*

A. It *arises* from the outer part of the fibula from its middle down to the outer ankle; its fibres run obliquely outwards to a tendon, which becomes round, passes behind the outer ankle, is included in the same sheath with the peroneus longus, crosses behind it, and running forwards in a sheath proper to itself, is *inserted* into the root and external part of the metatarsal bone of the little toe.

Q. Describe shortly the *Flexor longus digitorum pedis?*

A. It *arises* from the back part of the tibia at the under edge of the poplitēus, and is continued down the inner edge of the bone by fleshy slips terminating in its tendon; also from the outer edge of the tibia, and between this double order of fibres the tibialis posticus is inclosed; about two inches above the ankle, it sends off a round tendon, which passes behind the inner ankle in a groove of the tibia, under two annular ligaments, and through a sinuosity at the inside of the os calcis; about the middle of the sole it receives a tendon from the flexor longus pollicis, and then divides into four tendons, which pass through the slits of the perforatus, and are *inserted* into the base of the third phalanx of the four small toes.

Q. Describe the *Flexor longus pollicis?*

A. It *arises* from the back part of the fibula, a little below its head, and continued down nearly to its under extremity by a double order of oblique fibres, which terminate in a tendon that passes under the annular ligament behind the inner ankle through a groove in the tibia, then in the astragalus; in the sole it crosses the tendon of the flexor longus digitorum, to which it gives a tendinous slip; it next passes between the sesamoid bones, and is *inserted* into the last joint of the great toe.

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Q. What muscles are FLEXORS OF THE FOOT at the ankle-joint?

A. *Four;* the tibialis antīcus, extensor longus digitorum pedis, extensor proprius pollĭcis, and the peronēus tertius of ALBINUS.

Q. Describe the *Tibialis antīcus?*

A. It *arises* tendinous from the tibia between its tubercle and articulation with the fibula; runs down fleshy on the outside of the tibia, adhering to it and to the upper part of the interosseous ligament: near the under part of the leg it sends off a strong round tendon, which crosses obliquely from the outside to the fore part of the tibia, passes through a ring under the annular ligament near the inner ankle, runs over the astragalus and os naviculare, and is *inserted* into the middle of the os cuneiforme internum, and base of the metatarsal bone of the great toe.

Q. Describe the *Extensor longus digitorum pedis?*

A. It *arises* from the upper and outer part of the head of the tibia, and from the head and nearly the whole length of the anterior spine of the fibula, from the aponeurosis, which covers the upper and outer part of the leg, and from the interosseous ligament; below the middle of the leg it splits into four round tendons, which pass under the annular ligament, become flat, and are *inserted* into the base of the first phalanx of the four small toes, and are expanded over their upper surface as far as the last phalanx; it extends the small toes, and assists powerfully in bending the ankle-joint. A portion of this muscle is called by some peronēus tertius.

Q. What are the origin, course, and insertion, of the *Peronēus tertius?*

A. It *arises* in common with the former muscle, from the middle downwards near to the mallcōlus externus of the fibula; it sends its fleshy fibres forwards to a tendon, which passes under the annular ligament in the same sheath with the extensor longus digitorum, and is *inserted* into the base of the metatarsal bone of the little toe.

Q. Describe the *Extensor proprius pollicis?*

A. It *arises* acute, tendinous, and fleshy, from the fore part of the fibula, a little below its head, and downwards near to the malleŏlus externus; its fibres run obliquely forwards to a tendon, which passes over the forepart of the astragălus and os navicŭlāre, and is *inserted* into the base of the first and second phalanges of the great toe; it extends the great toe, and assists in bending the ankle-joint.

SURGICAL PATHOLOGY OF THE ANKLE.

Q. Besides flexion and extension, has not the ankle-joint other motions?

A. Yes; the toes can be turned outwards or fibulad, and inwards or tibiad, to a small extent; and by the combined alternate action of flexors, extensors, adductors, and abductors, the foot can be made to describe a sort of rotatory motion describing an imperfect cone, with its apex at the ankle, and its base at the toes.

Q. What muscles perform the *motion of abduction fibulad?*

A. *Four;* the peronēus longus, peroneus brevis, peroneus tertius, and the extensor longus digitorum pedis.

Q. What muscles perform the *motion of adduction tibiad?*

A. *Four;* the tibialis posticus, extensor proprius pollicis, flexor longus digitorum, and flexor longus pollicis.

Q. What parts secure the *ankle-joint against injuries?*

A. It is secured, in the first place, by the construction of the bones, the inferior end of the tibia being hollow, covered and deepened on its brim, by being surrounded with cartilage, for the reception of the astragalus; defended on the inside by its own depending process, which forms the malleŏlus internus; defended on the outside by the extremity of the fibula, which forms the malleŏlus externus: in the second place, by strong ligaments, namely, the capsular ligament; the anterior and posterior superior, and the interosseous ligaments, which bind the tibia and fibula together; the anterior, perpen-

dicular or middle, and posterior ligaments, which bind the malleŏlus externus firmly to the astragălus and os calcis; and the deltoid ligament, which binds the malleŏlus internus very firmly to the astragalus, os calcis, and os naviculare: and in the third place, by the strong tendons of the muscles; viz. by the tendons of the tibialis anticus, flexor longus digitorum pedis, flexor longus pollicis, and of the tibialis posticus, passing close upon the joint just behind the inner ankle; by the tendons of the peroneus longus, and peroneus brevis, passing close upon the joint immediately behind the outer ankle; by the tendons of the extensor longus digitorum pedis, peroneus tertius, and of the extensor proprius pollicis, spreading and passing on the fore part of the joint, and most firmly bound down upon it by the strong tendinous annular ligament of the tarsus; and by the tendo Achillis, and the plantaris behind.

Q. In consequence of such security, is the *ankle-joint* rarely *dislocated?*

A. It is much exposed by its frequent exercise to numerous accidents, and it is frequently dislocated inwards, more seldom outwards, and very rarely forwards, by too much extension.

Q. When *dislocation* happens *inwards* or *tibiad*, what parts are generally injured?

A. The process of the tibia forming the internal ankle, is fractured; the capsular and external lateral ligaments, attached to the malleolus externus, are ruptured; and the tendons of the peroneus longus and peroneus brevis are over-stretched.

Q. How is *such a luxation* to be *reduced?*

A. By gently pulling the foot in the direction of the tibia, and replacing the bones of the tarsus in the socket of the tibia; and by the easy flexion and extension of the joint afterwards, we are certain of it being properly reduced. A bandage and splints may be necessary to retain it in its situation until the ligaments adhere.

Q. When the *ankle* is *dislocated outwards*, what parts are generally injured?

A. The capsular and deltoid ligaments are ruptured; the fibula about an inch or two above the malleolus externus is fractured; and the tibialis anticus and posticus, the flexor longus digitorum, and the flexor longus pollicis, whose tendons pass behind the inner ankle, are tense and over-stretched.

Q. How is *reduction* in such a case *performed?*

A. By gently pulling the foot in extension, and replacing the astragalus in its socket, as in the last case; and afterwards by applying a splint on each side of the leg, and bandaging the joint in its proper situation.

Q. When the *ankle* is *dislocated by too great extension*, and the convexity of the astragalus thrown forward between the malleoli, what parts seem to be injured?

A. The capsular, lateral, and anterior annular ligaments are all ruptured; and the gastrocnemii in a state of over-distension.

Q. How is *such a luxation* of the ankle-joint to be *reduced?*

A. The over-stretched muscles should be relaxed as much as possible by bending the knee-joint, and then, while an assistant keeps the knee in that position, the surgeon, with one hand holding the heel, and with the fingers of the other placed over the fore part of the tarsal bones, should pull pretty forcibly in a line with the tibia, and then attempt to replace the astragalus in its socket by bending the toes and foot *rotulad.*

Q. How many MUSCLES are employed in the *motions* OF THE GREAT TOE?

A. Seven; *two extensors*, viz. the extensor brevis digitorum, and extensor proprius pollicis; *two flexors*, the flexor brevis pollicis, flexor longus pollicis, assisted by the diagonal forces of the abductor and adductor pollicis; the *adductor* assisted by the transversalis, and the *abductor* pollicis.

Q. Describe the *Extensor brevis digitorum?*

A. It *arises* fleshy and tendinous from the outer and fore part of the os calcis, forms a fleshy belly, which is divided into four portions, each of which sends off a

tendon, which crosses obliquely over the upper part of the metatarsal bones under the tendons of the extensor longus digitorum, and is *inserted* into the tendinous expansion of the long extensors on the inside of all the toes, except the little one.

Q. We have described the extensor proprius pollicis, and also the flexor longus pollicis, as arising from the fibula; therefore pass on to describe the *Flexor brevis pollicis?*

A. It *arises* tendinous from the under and fore part of the os calcis, and from the cuneiforme externum, divides into two heads, between which runs the tendon of the flexor longus; their tendons are *inserted* into the external sesamoid bone, and base of the first bone of the great toe.

Q. Describe the *Adductor pollicis?*

A. It *arises* by a long thin tendon from the under part of the os calcis, os cuboides, and os cuneiforme externum, and from the root of the metatarsal bone of the second toe; it divides into two fleshy portions, which are *inserted* into the external sesamoid bone, and base of the metatarsal bone of the great toe.

Q. Describe the *Transversalis?*

A. It *arises* tendinous from the upper and fore part of the metatarsal bone of the great toe, and from the internal sesamoid bone of the first joint, forms a fleshy belly, runs transversely between the metatarsal bones and tendons of the flexors, and is *inserted* tendinous into the under and outer part of the anterior extremity of the metatarsal bone of the little toe, and ligament of the one next it.

Q. Describe the *Abductor pollicis?*

A. It *arises* fleshy from the anterior and inner part of the protuberance of the os calcis; and tendinous from the same bone, where it joins the os naviculare; it is *inserted* tendinous into the internal sesamoid bone and base of the first bone of the great toe.

Q. What *muscles* are *peculiar* to the LITTLE TOE?

A. *Two;* the abductor minimi digiti, and the flexor brevis minimi digiti.

Q. Describe the *Abductor minimi digiti pedis?*

A. It *arises* from the under part of the protuberance of the os calcis, and from the base of the metatarsal bone of the little toe, sends off two small tendons; the one is *inserted* into the base of the metatarsal bone, the other into the outside of the base of the first phalanx.

Q. Describe the *Flexor brevis minimi digiti?*

A. It *arises* from the os cuboides, and from the outer and back part of the metatarsal bone, and is *inserted* into the anterior end of the metatarsal bone, and into the base of the first phalanx of the little toe.

Q. What muscles *Extend the toes?*

A. The extensor longus digitorum, and the extensor brevis digitorum, the little toe excepted, which we have already described.

Q. What muscles *Bend the small toes?*

A. The flexor longus digitorum, (profundus vel perforans), flexor brevis digitorum, (sublimis vel perforatus); in the little toe, the flexor brevis minimi digiti, and abductor minimi digiti, all of which we have already described, also the lumbricales, and interossĕi.

Q. Describe the *Lumbricāles?*

A. They *arise* from the tendons of the extensor longus digitorum just where it divides, are four in number, run forwards through the digitations of the palmar aponeurosis to the first phalanx, creep over the convexity of the bones, unite with the long extensors, and are *inserted* into the inside of the first phalanx, and into the tendinous expansion on the upper part of the toes; they assist in flexion and adduction of the toes.

Q. Is the *Flexor digitorum accessorius*, (vel massa carnea Jacobi Sylvii) connected with the lumbricales?

A. This fleshy mass *arises* from the sinuosity at the inside of the os calcis, and tendinous from the fore and outer part of it; and forming a square belly, is *inserted* into the tendon of the flexor longus, just where the lumbricales commence from it; it assists the flexor longus.

Q. How are the *Interossĕi* muscles divided?

A. Into three internal, and four external.

Q. Describe the *Interossĕi interni?*

A. They *arise* tendinous and fleshy from the inner and under part of the metatarsal bones of the small toes, and are *inserted* into the base of the first phalanx of the three small toes.

Q. Describe the *Interossĕi externi*, or bicipĭtes?

A. They *arise* by two slips from the contiguous sides of all the metatarsal bones, are situated on the back of the foot, and are *inserted* into the sides of the base of the first phalanx of the small toes; so that their tendons, the tendons of the lumbricales, of the extensor longus, and of the extensor brevis, all unite upon the sides and back of the toes, and form an aponeurotic sheath on the upper part of each toe.

OF THE BURSAE MUCÓSAE.

Q. What are you to understand by a Bursa Mucosa?

A. It is a bag or shut sac, placed most frequently under the tendons of muscles, when they require space to play in.

Q. What is the general shape of the Bursae?

A. They are generally either round, or oval; hence they have been arranged under two great classes, the *Spherical* and the *Vaginal Bursae.*

Q. What is the *structure* of a *bursa mucosa?*

A. The internal membrane of a bursa is thin, smooth, and lubricated by a fluid in all respects similar to synovia; its structure is the same as that of the internal layer of the capsular ligaments, of the pleura, periosteum, and of other serous membranes: the external membrane is common cellular substance, which unites the bursa to the neighbouring parts.

Q. What secretes the *lubricating fluid* in the bursae?

A. Within the bursae lie very small masses of fat, with fimbriae appended to them, and covered by a continuation of the internal membrane of the bursa; upon these masses numerous small ramifications of arteries are distributed, which make their colour of a pale red

huc. By these, and the vessels of the internal membrane itself, the fluid is secreted.

Q. Have the Bursae any *lymphatics* and *nerves* ?

A. Yes; the fluid secreted is absorbed by the lymphatics, and a constant renewal of it maintained; if this were not the case, they would become dropsical and burst: their lymphatic vessels, however, have hitherto eluded observation. In consequence of the extreme thinness of the coats of the bursae, nerves cannot be traced in them, and they seem in their healthy state possessed of but little sensibility; but when the bursae become inflamed, the great pain sufficiently demonstrates the presence of nerves in their structure.

Q. In what parts of the body are the bursae mucosae most frequent ?

A. They are chiefly to be found in the extremities, between the tendons and bones, or ligaments, between tendons which rub against each other, between tendons and their sheaths; and, in short, between all parts where the necessary motions of the body occasion friction.

Q. What are the *uses* of the bursae mucosae ?

A. They afford room for the parts coming in contact to move easily; and the gelatinous mucus, which they contain, lubricates those parts copiously, facilitates their movements, and prevents the effects of friction.

ON THE PHYSIOLOGY OF THE MUSCULAR SYSTEM.

PRELIMINARY DEFINITIONS.

On the motions and attitudes.

Q. What is meant by the vertical line ?

A. It is that line in the direction of which gravity operates.

Q. What is meant by the centre of gravity ?

A. It is that point, in which centre all the lines coming from every part and in the direction of which gravity operates.

Q. What is meant by equilibrium ?

A. When a body laid on a horizontal plane is so placed that the perpendicular let fall upon the horizontal plane from the centre of gravity falls between the two points between which the body is supported. The equilibrium of a body bearing upon a horizontal plane is the more stable as the centre of gravity of the body is nearer to the plane, and as the surface upon which it is supported is the more extensive.

Q. What is the base of sustentation?

A. The base of sustentation is the space between the two points of a plane surface by which a body is supported. Of two hollow columns formed of an equal quantity of similar materials, and of the same height, that which has the most considerable cavity is the strongest. Of two columns of the same diameter but of different heights, the weakest is the highest.

Q. What is meant by a lever?

A. A lever is an inflexible line, which turns upon a fixed point. The point of support or fulcrum, the power which moves and the resistance or weight to be moved, are the thiee things to be noticed in the lever. In a lever of the first kind, the fulcrum or point of support is between the resistance and the power. In the second kind of lever, the resistance or weight is between the power and the point of support. In the third, the power is between the resistance and the point of support. The power of the lever is proportional to the length of its arm, whether it be on the side of the power or of the weight: thus, if the arm on the side of the power is longer than that on the side of the weight or resistance to be moved, the advantage is on the side of the power in proportion as the length of the arm on the side of the power is greater than that on the side of the resistance: so that if the first is double or three times that of the second, it will be sufficient that the half or third of the power should be applied to bring the two forces to an equality. In the lever of the second kind, the arm of the power is necessarily longer than that of the resistance, because the last is placed between the power and the point of support, so that the power is at one end.

The advantage in this kind of lever is always on the side of the power: On the contrary, in the third kind of lever; since in this lever the power is placed between the resistance and the point of support, so that the resistance occupies one extremity. The lever of the first kind is most favourable for a balance; of the second kind, to overcome a resistance; of the third, to put a weight into great and rapid motion. The effect of a power is the more considerable, as the power acts perpendicularly to the lever: when the force is completely perpendicular, the whole force is then in action; when it is oblique, in proportion as it is so, a part of the force is wasted.

INERTIA.

Q. What is meant by inertia?

A. The disposition of bodies to continue in a state of motion or rest. The quantity of motion in a body is measured by the velocity of each part, multiplied by its mass or number of parts. This velocity may be acquired by the addition of a force in continued action, or it may be the result of one impulse. Every force therefore, impressed upon every body that is perfectly free, must produce in that body some motion; its direction, velocity, and the space performed in a given time, will depend upon its mass, or upon the impulse or on the intensity of the action exercised upon it, and the forces which draw it aside during its motion; thus, a body thrown from the hand acquires instantaneously a velocity the greater as the mass of the body is less; the continued action of its weight modifies continually both the velocity and the direction of the motion, which ceases when the body reaches the earth: the resistance of the air, the effect of which is increased with the velocity and the extent of surface of the body and its specific gravity, also retards it.

Q. What other circumstances influence motion?

A. The resistance or friction, produced by one body rubbing against another in passing over it.

Q. What is meant by adhesion?

A. The force with which two polished surfaces in contact are united to each other. It is measured by the perpendicular force required to separate them. In proportion as surfaces are polished so much greater is their adhesion, and in the same proportion the friction is weaker. The interposition of a liquid, as oil, has a good effect in filling up the inequalities, and polishing the surface.

Q. In what light are the bones to be considered in the physiology of motion?

A. As forming the basis of the locomotive system; they are and appear as levers of the three different classes; the first, where balancing is necessary; the second, where a considerable resistance must be overcome; the third, where great extent and quickness of motion are desired: their projections and prominences serve to change the direction of the tendons, and to cause their insertion nearer to the perpendicular to the shaft of the bone: by their shortness and solidity, they are of use where little motion is required, and much strength, as in the foot and vertebral column: by their flatness they give origin to the muscles, and protect the cavities: by their roundness as in the long bones, they give strength and beauty to the limbs; by the enlargement of the ends of the bones, they favour the perpendicular insertion of the tendons. The sponginess of the short bones enables them to present a considerable surface, without being too heavy.

Q. How do the articulations assist motion?

A. Their smooth cartilaginous surfaces, and the synovia introduced between them, render motion easy; the fibro-cartilaginous bodies between the vertebrae, which moderate the effects of shocks, make it more extensive.

ON THE ATTITUDES.

On the erect position.

Q. How is the erect position produced?

A. First the head, which is a lever of the first kind, is

supported on the vertebral column by the occipital muscles behind. The bones composing the vertebral column may be considered as a series of levers piled upon each other, in which the power is in the posterior muscles of the back; they support the fibro-cartilaginous substances between each, and the resistance, the viscera, the arms, and the neck, which give it a tendency to fall forward. The strength of the column consists in the bodies of the vertebrae, the different ligaments which unite them, and the fibro-cartilaginous substances between them. The curvatures of the surfaces of the bodies of the vertebrae opposed to each other, also increase the power of the vertebrae, so that they are not only able to bear the weight of the body, but also great burdens. The whole vertebral column is to be considered as a lever of the third kind, in which the support is in the point of junction of the vertebrae of the loins with the sacrum, the power the viscera, &c. above mentioned, and the resistance to be overcome the large muscles behind. The column is stronger, the processes more thick and horizontal, and the greatest force is exerted upon the lower part of the vertebrae near the sacrum.

Q. What are the circumstances which regulate the muscular force in supporting the vertebrae?

A. It acts more efficaciously in proportion as the spinous processes are longer, and more horizontal.

Q. What kind of lever does the pelvis represent?

A. It represents a lever of the first kind, for it is balanced upon the two femurs, the heads of which are the points of support; the weight and resistance being the abdominal viscera pressing it downwards, and the spine behind in the same direction.

Q. But is not the weight of the spine more considerable, and would it not over balance the abdominal viscera?

A. It is prevented by muscles which go from the femur to the pelvis, which have the power of drawing it downwards, and thus counteract the weight of the vertebral column. As the tendency of the vertebral column

from the weight of the head and chest is forwards, the balancing of the pelvis on the heads of the two femurs is assisted by the muscles which arise from the back part of the pelvis and back, and keep the head and back erect; the large muscles also arising from the back part of the thigh, and inserted into the back part of the pelvis, assist in controlling the equilibrium of the pelvis, when from any cause it has a tendency forward; this they are well calculated to do, from the length of lever made by the projection of the pelvis farther behind than before; the head supported on the atlas, the spine straight, and the pelvis balanced by these muscles, throw the weight of the parts above on the tibia in the erect position.

Q. What is the object of the direction of the head of the thigh upwards and inwards?

A. It supports the vertical pressure of the pelvis, and it resists the separation of the ilia, which the sacrum has a tendency to produce.

Q. How is the weight of the whole body which falls upon the head of the tibia, supported on the knee?

A. By the rectus and cruraeus inserted into its head, and also by the muscles on the back part of the leg, which arise from the posterior part of the condyles of the femur; the contraction of these muscles stiffen the leg, and enable it to support the weight of the parts above.

Q. What are the circumstances to be observed about the foot, in favouring the standing position?

A. The extent of the soles, which give a broad base for standing upon; the arched form of the foot, which makes it stronger; the fatty cushion below the heel and the thick epidermis, which enable it to bear sudden shocks.

Q. What is the use of the fibula?

A. From the effect of the pressure of the tibia, tending to throw the foot outwards, from the form of the arch of the foot, this bone prevents by its pressure that effect.

Q. What is the breadth of the base which supports the body?

A. It comprehends the length and breadth of the feet,

and the space between them: large feet, therefore, render this position more firm as they enlarge the base. On the contrary, the more the base is lessened, as by standing upon the toes, or upon a cord, the more muscular exertion is required to keep the line of direction within the base.

STANDING ON ONE FOOT.

Q. How is this position effected?

A. By a powerful action of the muscles about the hip, the equilibrium of the pelvis is thrown upon one thigh; the muscles of the hip on that side, the three glutei, the gemelli, the pyramidales, the obturators, the quadratus lumborum, produce a contraction, sufficiently powerful to support the body on the thigh in such a way that the line of direction falls within the base.

KNEELING, SITTING, AND LYING.

Q. What is to be observed with regard to these attitudes?

A. The first is uneasy, from the pressure being limited to two points, the surface of the knee pans; the base of sustentation is also narrow. With regard to sitting, it is firmer, because the base is larger and more easy from the flat and fleshy surface of the muscles, on which the body is supported; and because there are fewer muscles brought into play than in the standing position. With regard to lying, it is the easiest of all, because the muscles are all relaxed, and the surface of pressure is divided into many points, particularly when it is soft, as on a bed.

ON THE MOTIONS.

Of walking.

Q. How is the motion of walking performed?

A. Supposing the person in an erect posture, to walk forward at an ordinary pace, it is performed by first

bending one thigh upon the pelvis, straightening the leg, raising the foot from the ground, and thus producing a general shortening of the limb, which advances it forward; then the limb rests upon the ground, first touching with the heel, and successively the whole anterior parts of the foot. During this time the pelvis rotates upon the thigh upon the head of the limb which is immoveable; carrying forward the whole limb which is raised from the ground, and that whole side of the body. As yet there is no advance; the limb which is behind is brought forward in the following manner: the foot behind is detached from the heel to the toes, by a movement of rotation, of which the centre is the articulation of the metatarsus with the phalanges, so that towards the end of this movement, the foot does not touch, except by these last; the limb is lengthened, the trunk is carried forward, by rotating the pelvis on the head of the thigh formerly carried forward.

Q. What is the difference of walking forward in a straight line as regards the motions?

A. The pelvis in rotating on the respective thighs, advances successively in equal circles. If one is larger than the other, the course must be crooked.

Q. How is walking backwards performed?

A. One of the thighs is bent upon the pelvis, at the same time that the leg is bent upon the thigh, the extension of the thigh upon the pelvis follows, and the whole of the limb is carried backward; then the limb is straightened upon the thigh, the points of the toes touch the ground, and then the whole lower surface; at the same moment, the foot directed backwards touches the ground, that which remains forward rises on its point; the corresponding member is straightened; the pelvis pushed backwards, rotates upon the thigh directed backwards; the limb in advance quits the ground and carries itself backwards, to form a fixed point to a new rotation of the pelvis, which succeeds on the opposite limb.

Q. How is walking to one side effected?

A. One of the thighs is slightly curved upon the pelvis, to raise the foot from the ground; tho whole limb is abducted in that bent position, it is then applied to the ground; the other limb is approached to it, and so on.

Q. How is walking on an ascending plain effected?

A. By raising in a greater degree the leg which is thrown forward, and then raising up the body upon it; it is these circumstances which occasion its difficulty.

Q. How is walking down a descent effected?

A. In the same manner as forward, only that the posterior muscles of the trunk must contract with force to prevent the fall of the body forward?

Q. How is leaping performed?

A. By the sudden straightening of the lower extremities, which have been previously fixed, and the projection of the body in a vertical forward, or backward direction. The arms assist in leaping by the resistance necessary to raise them by the means of the muscles attached to the trunk: this resistance is of course increased by holding weights in the hands, from the greater difficulty of moving the arms.

Q. In what does running consist?

A. It consists in a combination of walking and leaping; it is different from rapid walking in this, that in running there is always a moment when the body is suspended in the air.

Q. In what does swimming consist?

A. It consists in repeated impulses of the feet and hands against the water, by which the body is propelled forward: it resembles leaping: by distending the lungs the body is made nearly of the same specific gravity as the water, otherwise it would sink; it is from the great difference of the specific gravity of water and air that it is impossible to fly.

ATTITUDES AND MOVEMENTS OF DIFFERENT AGES.

Q. What is the position of the foetus in the womb?

A. The thighs are bent upon the abdomen, the legs are applied to the thighs, the arms are crossed on the

fore part of the trunk, and the head rests upon the chest, to take up as little room as possible: it is the result of the disposition of the muscles to shorten themselves.

Q. Does the foetus move in the womb?

A. It begins to move in about four months; its motions are sudden, independent of the will, and most probably confined to the lower extremities.

Q. What is the attitude most natural to a new born infant?

A. The horizontal or that which best comports with its weakness.

Q. Does the sight influence our attitudes?

A. It gives us a clear view of the objects which surround us, and thus gives confidence to every action, by enabling us to avoid danger, &c. The difference between the movements of a blind man and one who can see, points out the effects of vision upon the muscular system.

Q. How are the gestures to be distinguished?

A. Into those which are natural, as those of savages and idiots; and those which are acquired in the social state; among the latter may be enumerated the gestures of the deaf and dumb which supply the place of speech, and also of the orator.

Q. What effect have internal sensations on the gestures and motions?

A. They have great effect; thus, pain, as that of colic, or a stitch in the side, bending the body.

Q. What relation have the attitudes and gestures with the will?

A. The will occasions them, but not directly: thus, I can set in motion my arm, but to do it I must first have a clear idea of the motion intended to be produced; without it, it is impossible to move either a single muscle or any combination of them.

Q. What are the instruments of the will more particularly?

A. The brain and the cerebellum; but the power which produces muscular motion is seated in the spinal marrow: thus, if the spinal marrow be divided behind

the occipital bone, the power of the will to determine the direction of the motions is taken away; for they are irregular, but the power of motion still remains. Under the idea that the action of the brain is distinct from that of the will, it is easy to conceive that in certain cases the simple irritation of the brain may produce extensive and violent movements of the muscles; and also the difficulty of the arts of fencing and dancing, in which the action of the muscles follows that of the will only after long and painful efforts.

Q. How is instinct connected with the attitudes?

A. Some, as those which have been called voluntary, and which we have just enumerated, are evidently partly dependent upon instinct; there are others which are entirely so; as the expressions of joy, grief, hunger, thirst, fear, &c.

Q. What effect have the passions on the force of the muscles?

A. Some, as anger, increase; others, as fear, grief, debilitate and diminish their power.

Q. What are the relations of muscular motion with the voice?

A. They are intimate; the gestures and the attitudes give great assistance to the expression of the voice: when words succeed each other slowly, the gestures are so much the more numerous; in the strong passions they are both used.

PATHOLOGY OF THE MUSCULAR SYSTEM.

TETANUS.

Q. What are its symptoms?

A. Violent, involuntary, and permanent contraction of the muscles of the whole body, or of some part of it, unaccompanied by disturbance of the mental functions, generally induced by lacerated wounds. In many instances we observe convulsive twitchings of the muscles, subsultus tendinum, acute pain, slowness of the pulse, and more or less hurried respiration. Sometimes the spasms

affect the elevator muscles of the lower jaw, causing the locked jaw; in other cases it is the extensor muscles of the trunk, and less frequently the flexors that are attacked, occasionally only one side is affected, hence the body may be bent backwards, forwards, or to one side. Tetanus may be mistaken for some disease of the brain and its membranes, and, still more probably, those of the spinal marrow.

Q. What are its Anatomical Characters?

A. Not known.

RHEUMATISM.

Q. What are its symptoms?

A. Pain, more or less acute, producing a gnawing sensation, increased by the action of the affected muscles; accompanied, particularly in acute cases, with swelling and slight redness of the integuments; generally brought on by cold and moisture. It is liable to sudden metastasis to the muscles of a different region or to the joints; when it is severe and very painful, it causes fever and various constitutional symptoms. The muscles most generally attacked, are those on the back of the neck, the parietes of the thorax, and the lumbar region, to which respectively are applied the terms torticoli, plarodynia, lumbago. When it comes on gradually, or when it becomes chronic, no swelling is observed; the pains are felt only at irregular intervals; sometimes, however, though rarely, they are continued, but in almost every instance they are increased by changes in the atmosphere or by cold. This affection is generally very tedious, lasting for many weeks, and in some instances for years, and after it has ceased, is very liable to return. Diseases with which it may be confounded, are the neuralgic affections.

Q. What are its anatomical characters?

A. When acute rheumatism is seated in muscular parts, if the inflammation has been very intense, pus is sometimes found infiltrated into the part affected, or even collected so as to form an abscess. The substance of the muscles is softened, of a reddish brown colour, easily

torn, and contains a bloody serum. When the disease is chronic, no very evident alteration can be perceived in the state of the parts.

ARTICULAR RHEUMATISM.

Q. What are its symptoms?

A. Acute, lancinating pain of one or more of the joints, increased by motion, or the slightest pressure, and accompanied by a greater or less degree of swelling of the affected part, and sometimes inflammation of the skin over it, with perceptible fluctuation. It most commonly attacks the large joints, as the knee, the wrist, the elbow. This inflammation readily changes from one part to another, generally causes fever, and is of very tedious duration.

Q. What are its anatomical characters?

A. The articulations are filled with purulent matter of various consistence, or with a bloody serum; the synovial membrane is often found injected, swollen, and, in some cases, altogether destroyed. The articular cartilages may be enlarged, thickened, diminished, or may have partly disappeared. Pus is sometimes found effused round the joint, or into the sheaths of the tendons.

GOUT.

Q. What are its symptoms?

A. Inflammation attacking the small joints, but more especially that of the great toe, and the phalanges; it is generally remarked to be hereditary, and continuing a great part of the patient's life, and not accidental, as acute articular rheumatism; rarely occurring before the age of thirty years, chiefly attacking those who live luxuriously, often connected with intestinal irritation, recurring in regular or irregular paroxysms, in which a more or less violent pain attacks the great toe, the ankle, or the heel, lasts for some time, and goes off; the affected part remaining a little red and swollen. Concretions

of urate of soda or lime, are often formed on the joints after these paroxysms. In cases of long standing, or in the erratic species, the diagnosis is often very difficult.

Q. What are its Anatomical Characters?

A. Calcareous concretions of the joint, with some appearance of inflammation.

OF THE BRAIN, AND ORGANS OF THE SENSES.

THE INTEGUMENTS AND ORGANS OF TOUCH.

Q. Of what parts do the common integuments of the body consist?

A. Of *three;* the cuticle, rete mucosum, and cutis.

Q. Describe the *Cuticle* or *Epidermis*, as shortly as possible?

A. It is a thin, semi-transparent, insensible membrane, squamous and furrowed externally, and smooth internally; it covers the whole surface of the body, except under the nails, and is reflected inwardly to line the different passages; it is also perforated by the exhalant and absorbent vessels; by excretory ducts, and by the hairs.

Q. What is the *use* of the Cuticle?

A. It protects the subjacent sensible parts; renders the sense of touch tolerable and pleasant; defends the body from noxious substances; and regulates the exhalation and absorption of the skin.

Q. Describe the situation and structure of the *Rete Mucōsum?*

A. It is situated under the cuticle, which it connects with the cutis vera: it is composed of extremely minute vessels passing between the cutis vera and cuticle, and of a fine cellular substance binding them together; it is not found under the nails.

Q. Is not the Rete mucōsum the seat of colour?

A. Yes; the cellular texture contains a mucilaginous viscid matter, which gives the native colour to different tribes and nations.

Q. What is the situation and texture of the *Cutis Vera?*

A. It is situated under the corpus mucōsum, surrounds the whole body, is composed of fibres running in different directions, and intimately interwoven with each other; it is elastic, capable of great distension, and of recovering its former dimensions, its external surface is firm and dense, and its internal degenerates into cellular substance; it has innumerable perforations for the passage of exhalants, absorbents, subaceous ducts, and hairs.

Q. Is the *cutis vera* furnished with many blood-vessels and nerves?

A. Yes: it is supplied with innumerable blood-vessels and nervous filaments, so that it cannot be punctured with the sharpest instrument, without occasioning bleeding and pain; indicating the presence of a blood-vessel and nerve in the point punctured.

Q. Is the Cutis equally thick in all parts of the body?

A. No; it, like the cuticle, is thicker in the palms of the hands, and soles of the feet; thinner in the eyelids, and lips, &c., where the sense of touch is most acute.

PHYSIOLOGY OF THE SKIN.

Q. What organs constitute the SENSE OF TOUCH?

A. The *nervous papillae*, which are situated on the external surface of the cutis vera.

Q. Describe those *Papillae Nervōsae*?

A. They are small conical eminences, each composed of a fasciculus of nervous filaments, of an exhalant and an absorbent vessel, or perhaps of more; their bases sit upon the cutis, and their apĭces pierce the thin smooth membrane of the internal surface of the cuticle, and terminate under the squamous rough apparatus of its external surface: hence the extremities of the nerves are near to the objects of touch, an easy egress afforded to the perspirable matter from the exhalants, and a ready entrance of the fluid to be absorbed into the open mouths of the absorbents, provided the skin be naturally relaxed.

Q. Is the sense of touch augmented by any particular arrangement of the Papillae?

A. Yes: the cutis forms innumerable ridges, upon which the papillae are placed in double rows; these are disposed in a circular, winding, or parallel manner, very conspicuous in the points of the fingers, palms, lips, &c.

Q. What circumstances render the sense of touch more distinct and acute.

A. The thinness of the cuticle; number of the papillae present; flexion of the part, by which innumerable papillae come in contact with the object of touch; attention of the mind; and frequent exercise of the organ: hence the hand, tongue, lips, &c. are best fitted for touch, and have this sense in greatest perfection.

Q. Of what things are we enabled to judge by the sense of Touch?

A. By it we judge of the qualities of bodies, such as hardness, softness, roughness, smoothness, hotness, coldness, size, figure, distance, pressure, and weight.

Q. By what vessels is the PERSPIRATION thrown out on the surface of the body?

A. By the minute extremities of arteries, called exhalants, opening in the cuticle under the scales of its external surface.

Q. Is the halĭtus or insensible perspiration, and sweat or sensible perspiration, the same, and emitted by the same vessels?

A. Physiologists are not agreed upon this point; but it is extremely probable that the sensible and insensible perspiration are emitted by the same exhalant vessels, and possess the same general qualities.

Q. What circumstances render *Perspiration* more copious?

A. A high temperature of the atmosphere, exercise, exhilarating emotions of the mind, good general health, and sometimes sudden fear, and debility of constitution.

Q. What purposes in the animal economy does *perspiration* serve?

A. It is one of the Emunctories, by which things useless, or hurtful to the body, are thrown out of the mass of blood; it carries off superfluous animal heat,

and, by its quantity, so regulates the temperature of the body, that in every climate it is nearly uniform : and it thus prevents the occurrence of many inflammatory diseases.

Q. On what principles can *perspiration* carry off the *superfluous animal heat*, and cool the body?

A. On the *Chemical Principles of evaporation:* for, when a fluid is converted into vapour, it must have an increase of caloric to support it in that state: hence the fluid perspired receives an increase of caloric, which instantly converts it into vapour, from the surface of the body. While perspiration continues, the evaporation of the fluid on the surface of the body abstracts its superfluous heat, and thus maintains its temperature uniform.

Q. How can perspiration maintain nearly the same degree of temperature of the blood in every climate?

A. In northern regions, the perspiration is very inconsiderable, in consequence of the cold corrugating the texture of the skin, and contracting the exhalants; nay, fleecy warm clothing, which conducts caloric most slowly, is absolutely necessary to prevent the circumambient cold air from abstracting caloric from the animal body too rapidly, in its natural tendency to establish an equality of temperature among bodies: hence the superabundance of animal heat generated in the system is abstracted mechanically by the cold atmosphere alone. In tropical regions, however, the atmospherical temperature is high, producing copious perspiration, which being suddenly converted into vapour, abstracts caloric from the surface of the body, and maintains a constant refrigerating effect; whilst the moisture on the skin, in the form of sweat, and the temperature of the atmosphere being lower than that of the human body, co-operate in mechanically abstracting caloric from the body, and thus assist the refrigerating powers of evaporation of the perspired fluid; by which means, the temperature of the human body is kept pretty nearly the same in both these extremities of climate.

Q. What are the properties of the cutaneous perspiration.

A. It contains water, acetic acid, muriate of soda and potash, some animal matter, and oxide of iron. It also contains carbonic acid, and an oily matter.

Q. What are the general characters of this secretion as regards its increase and diminution, &c.

A. It is greatest immediately after and least during dinner; the feet, hands, armpits, forehead, perspire more freely than any other parts; its properties also differ in different parts of the body, as in the sole of the foot, and in the armpits.

Q. Where are the *extremities* of the CUTANEOUS ABSORBENTS to be found?

A. In the cuticle: their extremities are situated under the sealy texture of its external surface, but they are so very minute, that they have not yet been distinctly seen in the human body, even by the assistance of glasses of great magnifying power. They are supposed, however, to commence there with their patulous extremities, or mouths open.

Q. How can it be proved that there are such vessels?

A. They have been seen in fishes, and experience has taught us that various substances, as Opium, Turpentine, Mercury, and Camphor, can be taken into the system, when applied to its surface, with gentle friction.

Q. Has Cutaneous Absorption not been denied by some eminent physiologists?

A. Yes: but it has been proved by others equally respectable.

Q. How could it then be denied?

A. They found that when the body, or a part of it, say an arm, was simply immersed in a fluid, such as oil of Turpentine, the breath and urine did not communicate any of its odour, as they would have done, had absorption of Turpentine taken place. Besides, the anatomist can handle and work among putrid parts of a subject, without

receiving any injury from the absorption of putrid matter: a proof that none of it had been absorbed.

Q. Have not many Medical men fallen *victims* to the absorption of putrid matter in time of dissection?

A. Yes: but in those instances the cuticle had been scratched, cut, or otherwise injured; and then absorption can take place most easily; as we know from inoculation either with Variolous or Vaccine matter.

Q. Is the Cuticle, then, when entire, to be considered a defence against absorption; or does the cuticle prevent it from happening on the surface of the body?

A. The Cuticle, when sound, has certainly great power in defending the system against the absorption of noxious substances; but that power is limited, and depends upon certain circumstances; such as the temperature of the dissector's hands, the temperature and acrimony, or stimulating power of the fluid to be absorbed, &c.; for, if the hands of the Dissector are cold, or the fluid in which they are immersed is cold and of a bland quality, the texture not only of the cuticle, but also of the cutis, is constringed and corrugated, by which the mouths of the absorbents are contracted and completely shut; of course no absorption can take place. Again, if the fluid is acrid and stimulant, it forces the vessels to contract, and to shut their mouths; but a continuation of the stimulus applied may wear out and exhaust the contractile power of the vessels, and then absorption may happen.

Q. If the temperature of the Dissector's hands and the putrid fluid in which they are immersed, be nearly equal, could absorption take place?

A. Yes; particularly if the temperature be so high as 60 or 70 degrees; for then the texture of the skin is relaxed, and the mouths of the absorbents are open, and ready to take in whatever mild fluid comes in contact with them.

Q. In ordinary cases, when Mercurial ointment is rubbed upon the surface, is its absorption owing to an abrasion of the cuticle, or what?

A. It has been supposed to be in consequence of abrasion of it; but where the cuticle abraded by the friction used, the stimulus of the mercury would excite great pain, and a contraction of the mouths of the absorbents in the part; whereas neither pain, nor contraction of the vessels seems to take place. In order to promote absorption, the common temperature of the body, which keeps the texture of the skin relaxed, and gentle friction, which may insinuate the mercury under the numerous scales of the cuticle, that it may be brought into direct contact with the open extremities of the absorbents, are only necessary.

PATHOLOGY OF THE TISSUES.

AFFECTIONS OF THE SKIN.—ERYSIPELAS.

Q. What are its symptoms?

A. The skin of the affected part slightly swollen; of a red colour, with well defined but irregular edges; the redness disappears on the slightest pressure being applied, but instantly returns when this is discontinued; acute pain, attended with the sensation of burning heat; these symptoms are followed by slight desquamation; in some instances small miliary vesicles appear, and form in a short time yellowish crusts. Erysipelas is most frequently observed to affect the face and breasts. It often attacks different portions of the surface one after the other, and cases occur where it returns periodically. Generally found to be connected with disorder of the digestive organs. Many varieties are described, the following are the chief:—

Q. What are the symptoms of Phlegmonous Erysipelas?

A. This is characterized by the redness of the surface being very vivid, and diminishing in intensity from its centre to the circumference; and does not return so quickly after pressure. The swelling more distinct and hard; pain burning and *pungent;* it generally terminates by suppuration; is observed to attack the extremities and scalp.

Q. What are the symptoms of Œdematous Erysipelas?

A. The swelling comes on slowly; is not so hard as in the other species; rather inelastic; the skin smooth, shining, and retains the impression of the finger for some time; vesicles are formed, and followed by other yellowish crusts. This affection very often induces gangrene; attacks the organs of generation and the lower extremities of hydropic patients.

Q. What are its Anatomical Characters?

A. On examination after death, the redness is found to have disappeared; the skin infiltrated, and a bloody serum flows from it when cut. Its texture is changed, as it is much more easily torn than when in the natural state. In the simple erysipelas the skin is found changed in its superficial vascular layers only; but in the phlegmonoid, its whole thickness is affected, and the veins are found diseased, their internal coat red, and occasionally they are seen filled with pus, a phenomenon never observed in the arteries of the same parts. Pus is also met (in the phlegmonous erysipelas) effused into the cellular membrane, or collected in one or more abscesses. When it terminates by gangrene, the vesicles are observed to be black and friable.

ZONA.

Q. What are its Symptoms?

A. A successive eruption of pustules, extending half way round the trunk, and sometimes completely surrounding it. The pustules of different colours, white, red, or brown, are pointed towards their summits, and are surrounded by a red circle. They contain a limpid fluid which proves very irritating to the parts it comes in contact with. When one set goes off, another constantly appears. This affection remains longer than erysipelas; its duration may be stated at from twenty-five to forty days. The patient suffers a very acute burning sensation in the affected part; and this disease occasionally is followed by obstinate pains. In some rare examples, a slight swelling of the subcutaneous

cellular tissue is perceived. The diseases with which it may be confounded, are pemphigus, erysipelas, and herpes.

Q. What are its Anatomical Characters?

A. The same as simple erysipelas.

URTICARIA, OR NETTLE RASH.

Q. What are its Symptoms?

A. A general redness of the skin, very soon followed by an eruption, sometimes general, sometimes partial, of irregular, flattened, hard, and various sized tubercles, whose bases are of a deep and vivid red, and centres of a very pale colour, and *flattened*. They are accompanied by a very hot sensation, and violent and continual itching. They always terminate in resolution or desquamation.

Q. What are its Anatomical Characters?

A. The same as simple erysipelas.

MILIARIA.

Q. What are its Symptoms?

A. An eruption, appearing on the whole surface at the same time, or on different portions successively, of small transparent vesicles, placed sometimes in the centre of small purple spots; or of red conical granulations, more readily perceived by the touch than the sight: they may be distinct or confluent, and are changed into vesicles containing a serous fluid: they sometimes extend to the mucous membrane lining the mouth, œsophagus, and trachea. This affection generally terminates in desquamation, sometimes by resolution.

PEMPHIGUS.

Q. What are its Symptoms?

A. Red patches of an erysipelatous appearance, but the redness does not disappear under pressure, is at-

tended by tumefaction of the skin, and formation of phlyctenoid vesicles, which vary in size from that of a lentil to a hen's egg, and even now and then much larger. In six or seven days these vesicles collapse, break, and discharge a limpid, yellowish, and mild serosity. Sometimes they dry up, scale off, and leave violet spots on the surface, which remain for some time: now and then ulceration takes place, and is followed by cicatrization. It may be confounded with zona or erysipelas.

Q. What are its symptoms?

A. Small pimples, or confluent round red patches, easily felt, with prickling pain and itching, which is increased at night, by heat or stimulating food. This eruption may appear on the whole surface, but it is mostly observed on the face, neck, shoulders, back, and hands. It recurs very frequently and at certain seasons.

TINEA, OR SCALD HEAD.

Q. What are its symptoms?

A. Violent itching of the scalp or forehead; small pustules or vesicular eminences are observed; these are hard, of a conical shape, whitish, and contain a fluid of a very disagreeable odour; on the appearance which this takes when drying, is founded the description of the various species of this affection.

Q. What are the symptoms of Tinea Favosa?

A. In this species, thick yellowish crusts are formed of various sizes, of a tubercular form, with a conical depression in the centre. These *scabs* are buried in the skin and scalp, in which large fissures are made around these, discharging a purulent, thick and fetid matter. This variety is observed to attack the forehead, temples, and neck of children from two to fifteen years.

Q. What are the symptoms of Tinea Rugosa?

A. The crusts or scabs in this species are small, granular, of a greyish or brown colour, and are compared to the pieces of mortar which are seen to fall from old walls. The smell is sour: there is no depression in the

centre. Rarely met with in adults, and is confined to the scalp.

Q. What are the symptoms of Tinea Furfuracea?

A. There are no crusts; there are white scales, more or less thick; from under which a fetid viscid liquid oozes, which dries and gives rise to new scales. This form of tinea does not occur in adults, or even in children after their seventh year.

Q. What are the symptoms of Tinea Amiantacea?

A. Small scales of a silvery or pearl colour surrounding the hair in their entire length, and so forming filaments and meshes like the asbestos or amiantus, whence the name is derived. It emits no particular smell; occurs only during adult age, and particularly in melancholic individuals.

Q. What are the symptoms of Tinea Mucosa?

A. Superficial ulcerations, from which exudes a mucous humour, somewhat like honey; this, as it dries, forms crusts of an ash colour, or greenish, occasionally yellow like wax. This species of the disease sometimes extends to the face, temples and limbs, in the same way that the tinea favosa does. It occurs usually in children from the period of lactation to their fourth year.

Q. What are its Anatomical Characters?

A. The cutis remains without any perceptible alteration as long as the disease continues moderate, but when it makes any considerable progress the skin is altered in its entire substance; it becomes red, and injected with a sanguineous fluid; in some extreme cases the sub-cutaneous cellular texture, the muscles, periosteum, and even the bones become engaged and their structure altered.

The Tinea of Alibert is the Porrigo of Willan and Bateman. The "Teigne faveuse" corresponds with the Porrigo lupinosa—the T. furfuraceé is the P. furfurous—the "Teigne muqueuse," corresponds to the Porrigo larvalis.—See *Bateman's Synopsis*, No. 159.

PRURIGO*.

Q. What are its symptoms?

A. The characteristic symptoms of this genus are, a severe itching, accompanied by an eruption of papulae, of nearly the same colour with the adjoining cuticle. It affects the whole surface of the skin, under three varieties of form, as well as some parts of the body locally.

Q. What are the symptoms of Prurigo mitis?

A. It is accompanied by soft and smooth papulae, somewhat larger and less accuminated than those of Lichen, and seldom appearing red or inflamed, except from violent friction. Hence an inattentive observer may overlook the papulae altogether: more especially as a number of small, thin black scabs are here and there conspicuous, and arrest his attention. These originate from the concretion of a little watery humour, mixed with blood,

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* The translator here substitutes a few sections from Bateman's synopsis, in place of those in the original. This will probably be excused when it is considered that the terminology adopted by Willan and Bateman, is now universally used in the schools in this country, and therefore will be much more readily understood by the younger members of the profession, for whom alone this little work is intended.—There is also another reason, M. Martinet has adopted the terms and arrangement of Alibert. This is liable to one serious objection, viz. that the descriptions of the diseases are often taken from secondary characters, whilst Willan and Bateman have taken them from the primary as far as was possible.

Thus, Alibert arranges the "Dartres" according to the characters of the scales which are secondary in their appearance, and, of course, liable to great variety, and subject to be influenced by the treatment pursued. But Bateman takes his descriptions from the appearance of the vesicles, which are primary in their occurrence, and far less liable to be influenced by any accidental causes.

which oozes out when the tops of the papulae are removed by the violent rubbing or scratching which the severe itching demands. This constant friction sometimes also produces inflamed pustules; which are merely incidental, however, when they occur at an early period of the complaint. The itching is much aggravated, both by sudden exposure to the air, and by heat; whence it is particularly distressing when the patient undresses himself, and often prevents sleep for several hours after he gets into bed. This eruption mostly affects young persons, and commonly occurs in the Spring or beginning of Summer. It is relieved after a little time by a steady perseverance in the use of the tepid bath, or of regular ablution with warm water, although at first this stimulus slightly aggravates the eruption. The internal use of sulphur, alone or combined with soda or a little nitre, continued for a short time, contributes to lessen the cutaneous irritation; and may be followed by the exhibition of the mineral acids. Under these remedies, the disorder gradually disappears: but if the washing be neglected, and a system of uncleanliness in the apparel be pursued, it will continue during several months, and may ultimately terminate in the contagious scabies.

Q. What are the symptoms of Prurigo formicans?

A. This affection differs materially from the preceding, in the obstinacy and severity of its symptoms, although its appearances are not very dissimilar. The itching accompanying it is incessant, and is combined with various other painful sensations; as of insects creeping over and stinging the skin, or of hot needles piercing it. On undressing, or standing before a fire, but above all on becoming warm in bed, these sensations are greatly aggravated: and friction not only produces redness, but raises large wheals, which, however, presently subside. The little black scabs, which form upon the abraded papulae, are seen spotting the whole surface, while the colourless papulae are often so minute as nearly to escape observation. This prurigo occurs in adults, and is not peculiar to any season. It affects the whole of the trunk and limbs, except the feet and palms of the hands; but

is most copious in those parts over which the dress is tightest. Its duration is generally considerable, sometimes extending, with short intermissions, to two years or more. It is never, however, converted, like the preceding species, into the itch, nor becomes contagious; but it occasionally ends in impetigo.

Q. What are the symptoms of Prurigo Senilis?

A. The frequent occurrence of prurigo in old age, and the difficulty of curing it, have been the subject of universal observation. The sensation of itching, in the prurigo of that period of life, is as intolerable and more permanent than in the P. formicans; and the appearances which it exhibits are very similar, except that the papulae are for the most part larger. The comfort of the remainder of life is sometimes entirely destroyed by the occurrence of this disease. A warm bath affords the most effectual alleviation of the patient's distress, but its influence is temporary. The disorder seems to be connected with a languid state of the constitution in general, and of the cutaneous circulation in particular; hence the sulphureous waters at Harrowgate, employed both internally and externally at the same time, afford on the whole the most decided benefit. A warm sea-water bath has also been found serviceable. Sometimes stimulant lotions, containing the oxymuriate of mercury, the liquor ammoniae acetatis, or alcohol, are productive of great relief, and occasionally render the condition of the patient comparatively comfortable, or even remove the disease. When the surface is not much abraded, the oxymuriate will be borne to the extent of two grains to the ounce of an aqueous or weak spirituous vehicle; but it is generally necessary to begin with a much smaller proportion. This mineral salt is likewise useful in destroying the pediculi, which are not unfrequently generated, when the prurigo senilis is present. Where the skin is not abraded by scratching, the oil of turpentine, much diluted with oil of almonds, may be applied, with more decided effect, for the destruction of these insects.

ICHTHYOSIS.

Q. What are the symptoms of Ichthyosis?

A. The ichthyosis, or fish-skin disease, is characterized by a thickened, hard, rough, and in some cases almost horny texture of the integuments of the body, with some tendency to scaliness, but without the deciduous exfoliations, the distinct and partial patches, or the constitutional disorder, which belong to lepra and psoriasis.

Q. What are the symptoms of Ichthyosis simplex?

A. In its commencement, this disease exhibits merely a thickened, harsh, and discoloured state of the cuticle, which appears, at a little distance, as if it were solid with mud. When further advanced, the thickness, hardness and roughness become much greater, and of a warty character, and the colour is nearly black. The roughness, which is so great as to give a sensation to the finger passing over it, like the surface of a file, or the roughest shagreen, is occasioned by innumerable rugged lines and points, into which the surface is divided. These hard prominences, being apparently elevations of the common lozenges of the cuticle, necessarily differ in their form and arrangement in different parts of the body, according to the variations of the cuticular lines as well as in different stages and cases of the complaint. Some of them appear to be of uniform thickness from their roots upwards; while others have a short narrow neck, and broad irregular tops. The former occur where the skin, when healthy, is soft and thin; the latter where it is coarser, as about the olecranon and patella, and thence along the outside of the arms and thighs. On some parts of the extremities, however, especially about the ankles, and sometimes on the trunk of the body, these excrescences are scaly, flat, and large, and occasionally imbricated, like the scales of carp. In other cases, they have appeared separate, being intersected by whitish furrows. This unsightly disease appears in large continuous patches, which sometimes cover the greater part of the body, except the flexures of the joints, the inner and

upper part of the thighs, and the furrow along the spine. The face is seldom severely affected; but in one case, in a young lady, the face was the exclusive seat of the disorder, a large patch covering each cheek, and communicating across the nose. The mammae, in females, are sometimes encased in this rugged cuticle. The whole skin, indeed, is in an extremely dry and unperspirable condition, and in the palms of the hands and soles of the feet it is much thickened and brittle. The disease often commences in childhood, and even in early infancy. This affection has been found to be very little under the control of medicine. Stimulating ointments and plasters have been industriously applied, with no material effect; and the disorder has been known to continue for several years, with occasional variations. Dr Willan trusted to the following palliation by external management "When a portion of the hard scaly coating is removed," he says, "it is not soon produced again. The easiest mode of removing the scales is to pick them off carefully with the nails from any part of the body, while it is immersed in hot water. The layer of cuticle, which remains after this operation, is harsh and dry; and the skin did not, in the cases I have noted, recover its usual texture and softness; but the formation of the scales was prevented by a frequent use of the warm bath, with moderate friction. I have known the skin cleared of this harsh eruption by bathing in the sulphureous waters, and rubbing it with a flannel or rough cloth, after it had been softened by the bath; but the cuticle underneath did not recover its usual condition; it remained bright and shining: and the eruption recurred. Internally the use of pitch has in some instances been beneficial, having occasioned the rough cuticle to crack and fall off, and leave a sound soft skin underneath. This medicine, made into pills with flour, or any farinaceous powder, may be taken to a great extent, not only without injury, but with advantage to the general health; and affords one of the most effectual means of controlling the languid circulation, and the inert and arid condition of the skin. Upon the same principle, the arsenical solution

has been employed in ichthyosis. In one case, in a little girl affected with a moderate degree of the disease on the scalp, shoulders, and arms, this medicine produced a complete change of the condition of the cuticle; which acquired its natural texture; but in two others no benefit was derived from it. The decoction of the inner bark of the elm has been said to be a specific for ichthyosis, by Plenck; but this originated in a misconception as to the use of the term.

HERPES.

Q. What are its symptoms?

A. This appellation is here limited to a vesicular disease, which, in most of its forms, passes through a regular course of increase, maturation and decline, and terminates in about ten, twelve, or fourteen days. The vesiclos arise in distinct but irregular clusters, which commonly appear in quick succession, and they are set near together, upon an inflamed base, which extends a little way beyond the margin of each cluster. The eruption is preceded when it is extensive, by considerable constitutional disorder, and is accompanied by a sensation of heat and tingling, sometimes by severe deep seated pain, in the parts affected. The lymph of the vesicles, which is at first clear and colourless, becomes gradually milky and opaque, and ultimately concretes into scabs; but, in some cases, a copious discharge of it takes place, and tedious ulcerations ensue. The disorder is not contagious in any of its forms. The ancients, although they frequently mention herpes, and give distinctive appellations to its varieties, have no where minutely described it. Hence their followers have not agreed in their acceptation of the term. It has been principally confounded with erysipelas on the one hand, and with eczema, impetigo, and other slowly spreading eruptions, on the other. But if the preceding character be well considered, the diagnosis between these affections and herpes will be sufficiently obvious. From erysipelas it may be distinguished by the numerous,

small, clustering vesicles, by the natural condition of the surface in the interstices between the clusters, and by the absence of redness and tumefaction before the vesicles appear; and from the chronic eruptions just alluded to, by the purely vesicular form of the cuticular elevations in the commencement, by the regularity of their progress, maturation, and scabbing, and by the limitation of their duration, in general, to a certain number of days.

Q. What are the symptoms of Herpes Phlyctaenodes?

A. This species of the eruption, including the miliary variety above mentioned, is commonly preceded by a slight febrile attack for two or three days. The small transparent vesicles then appear, in irregular clusters, sometimes containing colourless, and sometimes a brownish lymph: and, for two or three days more, other clusters successively arise near the former. The eruption has no certain seat; sometimes it commences on the cheeks or forehead, and sometimes on one of the extremities; and occasionally it begins on the neck and breast, and gradually extends over the trunk to the lower extremities, new clusters successively appearing for nearly the space of a week. It is chiefly the more minute, or miliary variety, which spreads thus extensively; for those which, at their maturity, attain a considerable size, and an oval form, seldom appear in more than two or three clusters together; and sometimes there is only a single cluster. The included lymph sometimes becomes milky or opaque in the course of ten or twelve hours; and about the fourth day, the inflammation round the vesicles assumes a duller red hue, while the vesicles themselves break and discharge their fluid, or begin to dry and flatten, and dark or yellowish scabs concrete upon them. These fall off about the eighth or tenth day, leaving a reddened and irritable surface, which slowly regains its healthy appearance. As the successive clusters go through a similar course, the termination of the whole is not complete before the thirteenth or fourteenth day.

The disorder of the constitution is not immediately relieved by the appearance of the eruption, but ceases as

the latter proceeds. The heat, itching, and tingling in the skin, which accompany the patches as they successively arise, are sometimes productive of much restlessness and uneasiness, being aggravated especially by external heat, and by the warmth of the bed.

The predisposing and exciting causes are equally obscure. The eruption occurs in its miliary form, and spreads most extensively, (sometimes over the greater portion of the surface of the body,) in young and robust people, who generally refer its origin to cold. But it is apt to appear, in its more partial forms, in those persons who are subject to headaches, and other local pains, which are probably connected with derangements of the chylopoietic organs.

The same treatment is requisite for this as for the following species.

Q. What are the symptoms of Herpes zoster?

A. This form of the eruption, which is sufficiently known to have obtained a popular appellation, the *shingles*, is very uniform in its appearances, following a course similar to that of small-pox, and the other exanthematic fevers of the nosologists. It is usually preceded for two or three days by languor and loss of appetite, rigors, head-ache, sickness, and a frequent pulse, together with a scalding heat, and tingling in the skin, and shooting pains through the chest and epigastrium. Sometimes, however, the precursory febrile symptoms are slight and scarcely noticed, and the attention of the patient is first attracted by a sense of heat, itching and tingling, in some part of the trunk, where he finds several red patches of an irregular form, at a little distance from each other, upon each of which numerous small elevations appear, clustered together. These, if examined minutely, are found to be distinctly vesicular; and, in the course of twenty-four hours, they enlarge to the size of small pearls, and are perfectly transparent, being filled with a limpid fluid. The clusters are of various diameter, from one to two, or even three inches, and are surrounded by a narrow red margin, in consequence of the extension of the inflamed base, a little be-

yond the congregated vesicles. During three or four days, other clusters continue to arise in succession, and with considerable regularity; these are nearly in a line with the first, extending always towards the spine at one extremity, and towards the sternum, or linea alba of the abdomen, at the other, most commonly round the waist, like half a sash, but sometimes, like a sword-belt, across the shoulder.

While the new clusters are appearing, the vesicles of the first begin to lose their transparency, and on the fourth day acquire a milky or yellowish hue, which is soon followed by a bluish, or livid colour of the basis of the vesicles, and of the contained fluid. They now become somewhat confluent, and flatten or subside, so that the outlines of many of them are nearly obliterated. About this time they are often broken, and for three or four days discharge a small quantity of a serous fluid; which at length concretes into thin dark scabs, at first lying loosely over the contained matter, but soon becoming harder, and adhering more firmly, until they fall off about the twelfth or fourteenth day. The surface of the skin is left in a red and tender state; and where the ulceration and discharge have been considerable, numerous cicatrices or pits are left.

As all the clusters go through a similar series of changes, those which appeared latest arrive at their termination several days later than the first; whence the disease is sometimes protracted to twenty, or even twenty-four days, before the crusts exfoliate. In one or two instances, I have seen the vesicles terminate in numerous small ulcers, or suppurating foramina, which continued to discharge for many days, and were not all healed before the end of the fourth week.

The febrile symptoms commonly subside when the eruption is completed; but sometimes they continue during the whole course of the disease, probably from the incessant irritation of the itching and smarting connected with it. In many instances the most distressing part of the complaint is an intense darting pain, not superficial, but deep-seated in the chest, which conti-

nues to the latter stages of the disease, and is not easily allayed by anodynes; sometimes this pain precedes the eruption.

Although the shingles commonly follow the regular course of fever, eruption, maturation, and decline, within a limited period, like the eruptive fevers, or exanthemata of the nosologists, yet the disorder is not, like the latter, contagious, and may occur more than once in the same individual. The disease, on the whole, is slight; it has never, in any instance that I have witnessed, exhibited any untoward symptom, or been followed by much debility; in the majority of cases, it did not confine the patient to the house.

The causes of the shingles are not always obvious. Young persons, from the age of twelve to twenty-five, are most frequently the subjects of the disease, although the aged are not altogether exempt from its attacks, and suffer severely from the pains which accompany it. It is most frequent in the Summer and Autumn, and seems occasionally to arise from exposure to cold, after violent exercise. Sometimes it has appeared critical, when supervening to bowel-complaints, or to the chronic pains of the chest remaining after acute pulmonary affections. Like erysipelas, it has been ascribed, by some authors, to paroxysms of anger.

Q. What is the treatment necessary in the shingles?

A. It is scarcely necessary to speak of the treatment of a disorder, the course of which scarcely requires to be regulated, and cannot be shortened, by medicine. Gentle laxatives and diaphoretics, with occasional anodynes, when the severe deep-seated pains occur, and a light diet, seem to comprise every thing that is requisite in the cure. Experience altogether contradicts the cautionary precepts, which the majority of writers, even down to Burserius, have enjoined, in respect to the administration of purgatives, and which are founded entirely upon the prejudices of the humoral pathology.

In general, no external application to the clustered vesicles is necessary; but when they are abraded by the

friction of the clothes, a glutinous discharge takes place, which occasions the linen to adhere to the affected parts, producing some irritation. Under these circumstances, a little simple ointment may be interposed, to obviate that effect. With the view of clearing off the morbid humours, the older practitioners cut away the vesicles, and covered the surface with their unguents, or even irritated it with the nitrico-oxyd of mercury, notwithstanding the extreme tenderness of the parts. These pernicious interruptions of the healing process, probably gave rise to ulceration, and prolonged the duration of the disease, and thus contributed to mislead practitioners in their views respecting its nature.

Q. What are the symptoms of herpes circinatus?

A. This form of the herpes is vulgarly called a *ring-worm*, and is, in this country, a very slight affection; being unaccompanied with any disorder of the constitution. It appears in small circular patches, in which the vesicles arise only round the circumference; these are small, with moderately red bases, and contain a transparent fluid, which is discharged in three or four days, when little prominent dark scabs form over them. The central area in each vesicular ring, is at first free from any eruption; but the surface becomes somewhat rough, and of a dull red colour, and throws off an exfoliation, as the vesicular eruption declines, which terminates in about a week with the falling off of the scabs, leaving the cuticle red for a short time.

The whole disease, however, does not conclude so soon; for there is commonly a succession of the vesicular circles, on the upper parts of the body, as the face and neck, and the arms and shoulders, which have occasionally extended to the lower extremities, protracting the duration of the whole to the end of the second or third week. No inconvenience, however, attends the eruption, except a disagreeable itching and tingling in the patches.

The herpetic ringworm is most commonly seen in children, and has been deemed contagious. It has

sometimes, indeed, been observed in several children, in one school or family, at the same time; but this was most probably to be attributed to the season, or some other common cause; since none of the other species of herpes are communicable by contact. It is scarcely necessary to point out here the difference between this vesicular ringworm, and the contagious pustular eruption of the scalp and forehead, which bears a similar popular appellation.

The itching and tingling are considerably alleviated by the use of astringent and slightly stimulant applications, and the vesicles are somewhat repressed by the same expedients. It is a popular practice to besmear them with ink; but solutions of the salts of iron, copper, or zinc, or of borax, alum, &c. is a less dirty form, and answers the same end.

Another form of herpes circinatus sometimes occurs, in which the whole area of the circles is covered with close set vesicles, and the whole is surrounded by a circular inflamed border. The vesicles are of a considerable size, and filled with transparent lymph. The pain, heat, and irritation in the part are very distressing, and there is often a considerable constitutional disturbance accompanying the eruption. One cluster forms after another in rapid succession on the face, arms, and neck, and sometimes, on the day following, on the trunk and lower limbs. The pain, feverishness, and inquietude do not abate till the sixth day of the eruption, when the vesicles flatten, and the inflammation subsides. On the ninth and tenth days a scabby crust begins to form on some, while others dry, and exfoliate; the whole disease terminating about the fifteenth day.

All the forms of herpes appear to be more severe in warm climates, than in our northern latitudes; and the inhabitants of the former are liable to a variety of herpetic ringworm, which is almost unknown here. This variety differs materially from the preceding in its course, and is of much longer duration. For it does not heal with the disappearance of the first vesicles, but its area continually dilates by the extension of the vesicular

margin. The vesicles terminate in ulcerations, which are often of a considerable depth; and while these undergo the healing process, a new circle of vesicles rises beyond them, which passes through a similar course, and is succeeded by another circle exterior to itself; and thus the disease proceeds, often to a great extent, the internal parts of the ring healing as the ulcerous and vesicular circumference expands.

Q. What are the symptoms of Herpes labialis?

A. A vesicular eruption upon the edge of the upper and under lip, and at the angle of the mouth, sometimes forming a semi-circle, or even completing a circle round the mouth, by the successive rising of the vesicles, is very common, and has been described by the oldest writers. At first the vesicles contain a transparent lymph, which in the course of twenty-four hours becomes turbid, and of a yellowish white colour, and ultimately assumes a puriform appearance. The lips become red, hard, and tumid, as well as sore, stiff, and painful, with a sensation of great heat and smarting, which continues troublesome for three or four days, until the fluid is discharged, and thick dark scabs are formed over the excoriated parts. The swelling then subsides, and, in four or five days more, the crusts begin to fall off; the whole duration being, as in the other herpetic affections, about ten or twelve days.

The labial herpes occasionally appears as an idiopathic affection, originating from cold, fatigue, &c., and is then preceded for about three days by the usual febrile symptoms, shiverings, headache, pains in the limbs and the stomach, with nausea, lassitude, and languor. Under these circumstances, a sort of herpetic sore throat is sometimes connected with it; a similar eruption of inflamed vesicles taking place over the tonsils and uvula, and producing considerable pain and difficulty of deglutition. The internal vesicles, being kept in a state of moisture, form slight ulcerations when they break; but these heal about the eighth and ninth days, while the scabs are drying upon the external eruption.

The herpes labialis, however, occurs most frequently

in the course of diseases of the viscera, of which it is symptomatic, and often critical; for these diseases are frequently alleviated as soon as it appears. Such an occurrence is most common in bilious fevers, in cholera, and dysentery, in peritonitis, peripneumony, and severe catarrhs; but it is not unfrequent in continued malignant fevers, and even in intermittents.

Q. What are the symptoms of Herpes praeputialis ?

A. This local variety of herpes was not noticed by Dr Willan; but it is particularly worthy of attention, because it occurs in a situation where it is liable to occasion a practical mistake, of serious consequence to the patient. The progress of the herpetic clusters, when seated on the prepuce, so closely resembles that of chancre, as described by some authors, that it may be doubted whether it has not been frequently confounded with the latter.

The attention of the patient is attracted to the part by an extreme itching, with some sense of heat; and on examining the prepuce, he finds one, or sometimes two red patches, about the size of a silver penny, upon which are clustered five or six minute transparent vesicles, which, from their extreme tenuity, appear of the same red hue as the base on which they stand. In the course of twenty-four or thirty hours, the vesicles enlarge, and become of a milky hue, having lost their transparency; and on the third day, they are coherent, and assume an almost pustular appearance. If the eruption is seated within that part of the prepuce, which is in many individuals extended over the glands, so that the vesicles are kept constantly covered and moist (like those that occur in the throat), they commonly break about the fourth or fifth day, and form a small ulceration upon each patch. This discharges a little turbid serum, and has a white base, with a slight elevation at the edges; and by an inaccurate or inexperienced observer, it may be readily mistaken for chancre; more especially if any escharotic has been applied to it, which produces much irritation, as well as a deep-seated hardness beneath the sore, such as is felt in true chancre. If no ir-

ritant be applied, the slight ulceration continues till the ninth or tenth day nearly unchanged, and then begins to heal; which process is completed by the twelfth, and the scabs fall off on the thirteenth or fourteenth day.

When the patches occur, however, on the exterior portion of the prepuce, or where that part does not cover the glands, the duration of the eruption is shortened, and ulceration does not actually take place. The contents of the vesicles begin to dry about the sixth day, and soon form a small, hard, acuminated scab, under which, if it be not rubbed off, the part is entirely healed by the ninth or tenth day, after which the little indented scab is loosened, and falls out.

This circumstance suggests the propriety of avoiding not only irritative, but even unctuous or moist applications, in the treatment of this variety of herpes. And accordingly it will be found, that, where ulceration occurs within the prepuce, it will proceed with less irritation, and its course will be brought within the period above-mentioned, if a little clean dry lint alone be interposed, twice a day, between the prepuce and the glands.

I have not been able to ascertain the causes of this eruption on the prepuce. Mr Fearson is inclined to ascribe it to the previous use of mercury. Whencesoever it may originate, it is liable to recur in the same individual, and often at intervals of six or eight weeks.

NAEVUS.

Q. What is to be said on the subject of naevus?

A. The various congenital excrescences and discolorations of the skin, to which the appellations of naevus, spilus, moles, &c. have been applied, may be conveniently treated of together. They exhibit many peculiarities of form, magnitude, colour, and structure, and are seen on almost every part of the surface of the body, in different instances. Some of them are merely superficial, or stain-like spots, and appear to consist of a

partial thickening of the rete mucosum, sometimes of a yellow or yellowish brown, sometimes of a bluish, livid, or nearly black colour. To these the term spilus has been more particularly appropriated. Others again exhibit various degrees of thickening, elevation, and altered structure of the skin itself; and consist of enlarged and contorted veins, freely anastomosing, and forming little sacs of blood. They are sometimes spread more or less extensively over the surface, occasionally covering even the whole of an extremity, or one half of the trunk of the body; and sometimes they are elevated into prominences of various form and magnitude. Occasionally these marks are nearly of the usual colour of the skin; but most commonly they are of a purplish red colour, of varying degrees of intensity, such as the presence of a considerable collection of blood-vessels, situated near the surface, and covered with a thin cuticle, naturally occasions.

The origin, which was anciently assigned to these marks by physicians, and to which they are still assigned by the vulgar, (viz. the influence of the imagination of the mother upon the child in utero,) has occasioned their varieties to be compared with the different objects of desire or aversion, which were supposed to operate on the passions of the mother; whence the following naevi have been described:—the flat and purple stains were considered as the representative of claret, or of port wine; and sometimes of a slice of bacon, or other flesh. Sometimes the stains are regularly formed, like a leaf, with a very red border, and lines, like veins, across from a central rib, forming the naevus foliaceus; and sometimes a small red centre with branching lines, like legs, has suggested the idea of a spider, or N. araneus. But those naevi which are prominent, have most commonly been compared to different species of fruit, especially to cherries, currants, and grapes, when the surface is smooth and polished; or to mulberries, raspberries, and strawberries, when the surface is granulated; whence the naevus cerasus, ribes, morus, rubus, fragarius, &c.

Some of these excrescences are raised upon a neck or pedicle; while some are sessile upon a broad base. Some of them again, although vivid for some time after birth, gradually fade and disappear; some remain stationary through life, but commonly vary in intensity of colour at different seasons, and under circumstances easily explained; and others begin to grow and extend, sometimes immediately after birth, and sometimes from incidental causes, at a subsequent period, and from small beginnings become large and formidable bloody tumours, readily bursting, and pouring out impetuous and alarming haemorrhages, which, if they do not prove suddenly fatal, materially injure the health by the frequent depletion of the system. Sometimes, however, after having increased to a certain degree, they cease to enlarge, and thenceforth continue stationary, or gradually diminish, till scarcely any vestige remains.

In some instances, however, these preternatural enlargements and anastomoses, which constitute the naevi, are not merely cutaneous. A similar morbid structure may take place in other parts; it sometimes occupies the whole substance of the cheek, according to Mr Abernethy, and has occurred in the orbit of the eye; and Mr John Bell affirms, that it affects indifferently all parts of the body, even the viscera.

The origin of these connate deformities is equally inexplicable with that of other anomalous and monstrous productions of nature; but it would be insulting the understanding of the reader, to waste one word in refutation of the vulgar hypothesis, which ascribes them to the mental emotions of the mother—an hypothesis totally irreconcilcable with the established principles of physiology, and with the demonstrable nature of the connexion between the foetus and the parent, as well as with all sober observation.

It is important, however, to know that very slight causes of irritation, such as a trifling bruise, or a tight hat, will sometimes excite a mere stain-like speck, or a minute livid tubercle, into that diseased action, which occasions its growth. This growth is carried on by a

kind of inflammatory action of the surrounding arteries; and the varying intensity of colour arises from the different degree of activity in the circulation. Thus these marks are of a more vivid red in the Spring and Summer, not in sympathy with the ripening fruit, but from the more copious determination of blood to the skin, in consequence of the increase of the atmospheric temperature. The same increased determination to the surface is also produced temporarily, and with it a temporary augmentation of the florid colour of the naevi, by other causes of excitement to the circulation; as by active exercise, by heated rooms, or the warmth of the bed, by drinking strong liquors, or high feeding, by emotions of the mind, and, in women, by the erethism of menstruation.

These considerations will serve to suggest the proper means of treating the naevi and spili, where any treatment is advisable. When they are merely superficial, without elevation, which would render them liable to accidental rupture, and without any tendency to enlarge and spread, there appears to be no good reason for interfering with them. The applications mentioned by the older writers were doubtless as futile as they were disgusting; such as saliva, the meconium of infants, the lochial blood of women, the hand of a corpse, &c. and the severe resource of the knife, even if the deformity of a scar were much less than that of the original mark, is scarcely to be recommended.

But when the naevi evince a tendency to enlarge, or are very prominent excrescences, and either troublesome from their situation, or liable to be ruptured, some active treatment will then be required. Either their growth must be suppressed by sedative applications, or the whole morbid congeries of vessels must be extirpated by the knife.

All strong stimulants externally must be avoided, as they are liable to produce severe inflammation, and even constitutional disorder.

The consideration of the mode in which these vascular excrescences grow, by a degree of inflammatory

action in the surrounding vessels, suggested to Mr Abernethy the propriety of maintaining a constant sedative influence upon those vessels, by the steady application of cold, by means of folded linen kept constantly wet. This practice has succeeded, in several instances, in repressing the growth of these unnatural structures, which have afterwards shrunk, and disappeared, or ceased to be objects of any importance. Pressure may, in some instances, be combined with this sedative application, and contribute to diminish the dilatation of the vessels; but in the majority of cases, pressure is the source of great irritation to these maculae, and cannot be employed. The temporary enlargement of these prominent naevi by every species of general excitement, would teach us to enjoin moderation in diet, exercise, &c. during the attempts to subdue them.

The mode of extirpation is within the province of the surgeon, and the proper choice of the mode, under the different circumstances, is directed in surgical books. From the days of Fabricus Hildanus, the propriety of radically removing every part of the diseased tissue of vessels has been inculcated; but Mr John Bell has most satisfactorily stated the grounds of that precept, by explaining the structure of these excrescences, as well as the source of the failure and danger, when they are only cut into, or opened by caustic. I shall therefore refer the reader to his "Discourse."

The varieties of spilus, or mere thickening and discoloration of the rete mucosum, are sometimes removable by stimulant and restringent applications. A combination of lime and soap is extolled by several writers; and lotions of strong spirit, with the liquor potassae, as recommended for the treatment of the ephelides and of pityriasis, certainly sometimes remove these maculae.

With respect to those brown maculae, commonly called moles, I have little to observe; for no advantage is obtained by any kind of treatment. It is scarcely safe, indeed, to interfere with them; for when suppuration is induced in them, it is always tedious, and pain-

ful, the matter emitting at the commencement an extremely fetid odour. When moles are irritated by accident, or rudely treated, so as to produce excoriation, they are liable, it is said, to become gangrenous, and thus to produce sudden fatality.

Moles are not always congenital. I lately saw an instance in a lady of remarkably fair and delicate skin, where a numerous crop of small moles appeared, in slow succession, upon the arms and neck. Congenital moles, indeed, are not always stationary; but they sometimes enlarge gradually for a time, and afterwards disappear.

Q. Whether do the Nails belong to the Cuticle or Cutis?

A. They are appendages of the cuticle, they grow from it, and are removed along with it by maceration, or boiling water.

Q. What is the *structure of the nails?*

A. They are fixed to a semilunar fold of the cutis vera at their roots, which are covered by a reflection of the cuticle adhering to them; they are composed of longitudinal fibres disposed in lamellae; they are insensible, have no evident vessels, and derive their nourishment from the vessels of the cutis, to which they firmly adhere.

Q. What purposes do the nails serve?

A. They defend the extremities of the fingers and toes, and assist us in laying hold of minute bodies.

Q. Where are the *roots* of the hairs situated?

A. Their roots, or bulbs, are situated under the cutis in the cellular substance.

Q. Describe the *bulbs* of the hairs?

A. They are of various forms, and have blood-vessels dispersed upon them: each bulb is said to have two capsules or membranes, containing an oily fluid between them, from which the hairs derive their colour.

Q. What is the *structure* of the hairs?

A. Different opinions have been entertained: some have thought that each hair is made of a number of smaller ones inclosed in a membrane derived from the cuticle; others that each hair is a tube, through which the only fluid flows, which gives the hair its peculiar colour.

Q. What uses do the hairs serve?

A. They seem destined for warmth, ornament, and protection.

Q. What is the situation of the SEBACEOUS FOLLICLES?

A. They are situated under the cutis vera, and are most numerous in parts exposed to the air and attrition?

Q. What is their *use?*

A. They are situated at the foot of every hair, and secrete an oily fluid, which is carried by the sebaceous ducts to the surface of the body, and poured out for the purpose of lubricating the skin. They are also situated in the ear, and secrete the wax, and on the genital organs, glans, penis, &c.

Q. Where is the ADIPOSE SUBSTANCE deposited?

A. The Fat or adipose matter is deposited in the cellular substance, and contained in small vesicles, that are surrounded by a net-work of blood-vessels; by which the oily matter composing the fat is supposed to be secreted.

Q. Do these vesicles communicate with each other, and with the common cellular substance?

A. They neither have any communication with each other, nor with the cellular substance.

Q. Have they excretory ducts for removing the fatty matter; or how is it supposed to be renewed?

A. No ducts have yet been perceived to come from them; the fat is supposed to transude from the vesicles, and to be taken up by the absorbents; for it, like other parts of the body, must be constantly changing and renewed.

A. Is *fat* deposited in all parts of the body?

A. No: it is awanting in the substance of the vis-

cera, such as the brain, lungs, heart, liver, spleen, kidneys, &c.; and in other parts, as the scrotum, penis, eye-lids, and about the joints, where its bulk would have been inconvenient, but it surrounds some of them.

Q. What purposes does the fat serve?

A. It fills the interstices of various parts, gives beauty and form to them, defends delicate organs embedded in it; lubricates and facilitates the motions of various parts, as the external surface of the intestines, and affords nourishment to the system in various diseases, and to some animals during their dormant state.

Q. Of what does the fat consist?

A. Of two distinct substances, stearine and elaine; it is inodorous and oily.

Q. What is the situation and texture of the CELLULAR MEMBRANE?

A. It is a fine membrane, composed of many thinner layers irregularly joined together, which form innumerable cells communicating freely with one another. It binds the skin to the subjacent parts, is a general covering to the whole system; and, in short, forms a part of almost every organ.

Q. What are the purposes of its cells?

A. They admit of a considerable degree of motion to the contiguous parts, contain the adipose substance, and are every where moistened by an interstitial serous fluid.

Q. Of what does this serous exhalation consist?

A. Of the serum of the blood with some albumen.

Q. Of what does the exhalation of the cellular membrane consist?

A. It has the same components as the last.

Q. What is the *use* of the Cellular Membrane?

A. It connects the various soft parts of the system together, insinuates itself between the muscular fibres, and affords attachment to them: when more condensed, it forms the fasciae and tendons of muscles, and sheaths for them to play in: also the various membranes throughout the body; the periosteum which covers the bones; the ligaments and cartilages which connect them.

PATHOLOGY OF THE CELLULAR TISSUE.

PHLEGMON.

Q. What are its symptoms?

A. A round prominent tumour, with violent pulsating pain, great heat, and intensely red in the centre, gradually diminishing towards its base. Pain and swelling usually precede the redness: it attacks the parts of the body which contain quantities of cellular membrane; generally terminates by suppuration, and the formation of an abscess. When it occurs in the groin, it is called a *bubo;* in the region of the parotid gland *cynanche parotidaea*, or *mumps;* and *whitlow*, when situated in the subcutaneous cellular tissue of the fingers, or the tendinous sheaths which surround them. Phlegmon may be confounded with anthrax, furunculus, carbuncle, or erysipelas.

Q. What are its Anatomical Characters?

A. In the first stage, the cellular substance is red, injected with blood, and very easily torn; in a short time, when the formation of pus is commencing, we find a gelatinous fluid issues on pressing the parts, but is soon changed into real purulent matter: this at first is found in numerous small collections, but finally one sac is formed; the parts around are injected with blood; the internal surface of the abscess has the appearance of a mucous membrane: when the inflammation becomes chronic, it changes colour and turns greyish.

FURUNCULUS OR BOIL.

Q. What are its symptoms?

A. A conical, circumscribed, hard, and very painful tumour of a fiery red colour, and very hot; terminating in suppuration; small pieces of mortified cellular substance generally come away with the purulent matter. This affection consists of an inflammation of the cellular substance which fills the conical papillae of the dermis, generally observed at the verge of the anus on the buttocks; the scrotum and internal parts of the thighs.

Their volume varies from the head of a pin to the size of a cherry, and are observed to appear in great numbers successively. It may be confounded with anthrax, carbuncle, erysipelas, or phlegmon.

ANTHRAX (BENIGN).

Q. What are its symptoms?

A. An inflammatory, circumscribed, very hard and painful tumour, of a violet red colour, exceedingly hot, especially at the top of the tumour; in this is found a thick, flocculent, and bloody matter, very fetid; even after the suppuration takes place, it still spreads; many irregular openings are formed, at the bottom of which the cellular substance is seen greyish and sloughing in layers; attacks the neck, back, parietes of the thorax and abdomen, and the shoulder. It sometimes is several inches in circumference. It may be confounded with furunculus and carbuncle.

Q. What are its Anatomical Characters?

A. In the first stage they are the same as described in phlegmon; in the more advanced stages, the cuticle mortifies, and forms a blackish crust; it is swollen and infiltrated with blood and serum. Pus may be found in the cells of the cellular tissue, or collected into an abscess.

MALIGNANT PUSTULE.

Q. What are its symptoms?

A. A small spot appears on the skin without any precursory symptoms; this is followed by a small vesicle, which produces most violent itching; it soon breaks, and a serous, very irritating, yellowish fluid flows from it; in its centre, a dry livid spot may be observed. In a very short time a dreadful burning heat comes on; new vesicles are formed round the gangrenous spot; with an oedematous swelling of the skin, at first very pale and glossy, then erysipelatous; the tumour extends, and all the symptoms increase; and constitutional phenomena commence of a nervous or low typhoid

type, active in their most aggravated form. In its commencement this disease is purely local, and easily cured by surgical means. It proceeds from the contact of the remains of animals which have died of the carbuncle. It is always sporadic. It may be confounded with anthrax, carbuncle, or erysipelas.

Q. What are its Anatomical Characters?

A. The same as erysipelas, with gangrene of the skin, and cellular membrane.

CARBUNCLE, OR MALIGNANT ANTHRAX.

Q. What are its symptoms?

A. A very hard and painful low tumour, of a fiery red colour in its circumference, but livid and black in its centre; surrounded very often by small tumours, which soon become black, or vesicles containing an irritating serosity: always accompanied by constitutional symptoms, and generally preceded by them. It is one of the worst symptoms in pestilential diseases. Very often epidemic, especially amongst quadrupeds, and may be communicated from them to man by the contact of their remains, or the use of the flesh. It may arise spontaneously: when left to itself it is speedily and invariably fatal. It may be confounded with malignant pustule, or anthrax.

Q. What are its Anatomical Characters?

A. Those of inflammation, and gangrene of the skin and cellular membrane.

OEDEMA.

Q. What are its symptoms?

A. Uniform, indolent, and inelastic swelling of the skin; it is pale, milky-white, and glossy; no heat; retains the impression of the finger for some time. In some cases it is confined to the lower extremities, in others it is general, and is then called anasarca. It may be confounded with emphysema, phlegmon and erysipelas.

Q. What are its Anatomical Characters ?

A. The cells of the subcutaneous and intermuscular cellular tissue, distended with a serous fluid.

SUBCUTANEOUS EMPHYSEMA.

Q. What are its symptoms ?

A. Indolent, colourless, shining and elastic swelling, which does not retain the impression of the finger; but, when pressed, a particular crepitating noise, quite characteristic, is heard. It may be mistaken for oedema.

Q. What are its Anatomical Characters ?

A. The swelling is produced by gaseous fluids passing into the cells of the cellular membrane.

HARDENING OF THE CELLULAR TISSUE.

Q. What are its symptoms ?

A. Great hardening of a portion or the whole of the cellular membrane; very firm, and not yielding to pressure; commencing generally in the hands and feet; extending along the extremities to the abdomen and face, and inducing a coldness in the integuments. It attacks infants newly born.

Q. What are its Anatomical Characters ?

A. The cellular tissue filled with an albuminous yellowish liquid, occasionally very thick and purulent.

OF THE BRAIN.

Q. How many membranes surround the brain.

A. *Three ;* the dura mater, tunica arachnoidea, and pia mater.

Q. What is the texture of the *Dura Mater* ?

A. It is very dense, is composed of tendinous-like fibres running in various directions, is the thickest and strongest membrane of the body.

Q. Does the *Dura Mater* adhere to the internal surface of the bones of the cranium ?

A. Yes; it adheres firmly to the cranium by a number of blood-vessels and cellular threads, but more intimately at the Sutures, where the vessels are much more numerous.

Q. Does the inner surface of the Dura Mater adhere to the coat immediately within ?

A. No; excepting at the Sinuses, where the veins enter; its internal very smooth surface is well lubricated by a fluid emitted from its exhalant vessels.

Q. What *processes* does the Dura Mater form ?

A. It forms the falx major, the falx minor, and the tentorium cerebelli super-extensum.

Q. Describe the *Falx major?*

A. The falx cerebri is composed of a doubling of the dura mater, is situated longitudinally between the two hemispheres of the brain, arises from the middle of the sphenoid, and crista galli of the ethmoid bone, adheres to the middle of the frontal, to the junction of the parietal; and, lastly, to the middle of the occipital bone, it becomes gradually broader, and terminates in the tentorium.

Q. Describe the *Tentorium cerebelli?*

A. It is formed by a duplicature of the dura mater, is connected with the transverse ridges of the occipital bone, with the ridges of the petrous portions of the temporal bones, and with the posterior clinoid process of the sphenoid bone: the posterior end of the falx major is attached to its middle.

Q. Describe the *Falx minor*, or *falx cerebelli?*

A. It descends from the middle of the tentorium, and from the under and back part of the falx major between the hemispheres of the cerebellum, is attached to the middle perpendicular ridge of the occipital bone, and terminates at the edge of the foramen magnum.

Q. Are any other parts formed by the Dura Mater ?

A. The dura mater lines the superior orbitary fissures, and the different foramina of the cranium, and also forms a sheath for the spinal marrow.

Q. Does the Dura Mater form the sinuses?

A. Yes: the dura mater forms them in a doubling of its layers, which are stretched tensely and make a triangular canal between them and the bone.

Q. Enumerate the different SINUSES ?

A. The principal are four, the superior longitudinal,

the two lateral, and the torcŭlar Herophĭli: besides these, there are other ten smaller sinuses, the inferior longitudinal, the circular sinus of Ridley, the two cavernous, two superior and two inferior petrōsal, the perpendicular occipital, and the anterior superior, and anterior inferior occipital sinuses.

Q. Is the Dura Mater supplied with many blood-vessels?

A. Yes: it must receive blood for its own nourishment, for part of that of the bones of the cranium, to which it forms an internal peri-cranium, and for the constant exhalation of the fluid, which moistens its internal surface.

Q. From what sources do its *arteries* arise?

A. Its principal arteries are the two Meningeal sent off from the internal maxillary; it receives branches also from the inferior pharyngeal, the opthalmic, the occipital, and the vertebral arteries.

Q. Is the Dura Mater possessed of much *sensibility?*

A. In its healthy and sound state it is insensible; which has been proved by experiments of pricking and injuring it, and by mechanical and chemical stimulants, without animals shewing any signs of pain; in its inflamed state, however, excruciating headach, and often delirium, are complete indications of its morbid sensibility.

Q. Where are the *glandulae* Pacchioni situated?

A. Some flesh-coloured granulations are situated upon the external surface of the dura mater near to the longitudinal sinus, and have formed corresponding pits in the internal surface of the bones: others of a whiter colour are situated upon its internal surface and contiguous parts of the brain near the longitudinal sinus.

Q. What is the use of these bodies?

A. The use of these glands is quite unknown: it has been conjectured that they belong to the lymphatic system.

Q. What is the structure and situation of the *Tunica Arachnoidēa?*

A. It is a very thin, transparent membrane, spread uniformly over the surface of the brain, and adhering

closely to the pia mater by fine cellular substance, without insinuating itself between the convolutions.

Q. Is it sensible and vascular?

A. The Tunica arachnoidēa is so thin and delicate, that neither blood-vessels nor nerves have been seen in it: its sensibility and vascularity therefore, must be very inconsiderable.

Q. Describe the texture and situation of the *Pia Mater?*

A. The Pia Mater is a tender, thin, semi-transparent membrane, extremely vascular; which enters double between the convolutions of the cerebral substance, and also lines the different ventricles.

Q. What is the *use* of the Pia Mater?

A. It tends to support the tender substances of the brain, and to keep its blood-vessels in their relative situations, and to allow them to be divided into very minute branches.

Q. Whence does the Pia Mater receive its blood for nourishment?

A. From the branches of the internal carotid, and vertebral arteries.

Q. Is there any peculiarity in the course of *the veins* of the Pia Mater?

A. Its veins are similar to those in other viscera; but are peculiar in not accompanying their arteries, as veins of other parts do, for they all terminate in the sinuses of the brain.

Q. Describe the situation and the divisions of the CEREBRUM?

A. The Cerebrum, situated in the fore and upper part of the cranium, is divided into two hemispheres by the falx: and each hemisphere is subdivided into three lobes, an anterior, a middle, and a posterior.

Q. What is conspicuous on the surface of the brain?

A. Its substance is disposed in various turnings and windings, termed *convolutions*, which are of different sizes and lengths.

Q. Describe the appearance of the substance of the brain after having made a horizontal section nearly on

a level with the corpus callōsum, and having removed the upper part?

A. The exterior substance is of a greyish ash colour, and termed *cineritious*, or *cortical:* the interior is white, and called *medullary*. The cineritious surrounds the medullary substance, and enters deep between its convolutions.

Q. What is called the *Centrum ovale* VIEUSSENII?

A. The medullary nucleus of an oval form in this section.

Q. Describe the *Corpus Callōsum*?

A. The corpus callosum is medullary substance, situated in the longitudinal middle line under the falx, and composed of transverse fibres, which unite the two hemispheres, meet and form a longitudinal *raphè* in its middle. It gradually becomes broader towards the posterior end.

Q. Describe the situation and structure of the *Septum Lucidum?*

A. It is placed immediately under the raphè of the corpus callosum, to which it is connected above, and it rests upon the fornix below. It is transparent, broader before, curved at its edge, and becoming narrow behind: it is composed of two laminae, a little separated from each other at its anterior part.

Q. Where is the *fissure* or *fossa of* SYLVIUS situated?

A. That fissure, also called the *sinus* of the septum lucidum, or *fifth ventricle*, is situated between the laminae at the anterior part of the Septum Lucidum.

Q. Does that fissure or fossa communicate with the other ventricles?

A. No: but in some Hydrocephalic cases, it, like the other ventricles, has been found full of fluid.

Q. How many *Ventricles* are there in the brain?

A. *Four:* two lateral, a middle, and an inferior one.

Q. Describe the *Lateral Ventricles?*

A. They are situated, one in each hemisphere, horizontally; are of an irregular winding figure, and have three cornua.

Q. How are these cornua situated?

A. The anterior are separated by the septum lucidum; the posterior are considerably distant, but approach nearer at their posterior extremities; the inferior cornua wind downwards and forwards in the middle lobes of the brain.

Q. What parts are to be seen *in the bottom* of the Lateral Ventricles?

A. The corpora striata, thalămi nervorum opticorum, taenia semicircularis of HALLER, choroid plexus, the fornix, and pedes hippocampi or cornua ammōnis.

Q. Describe the situation and structure of the *Corpŏra striāta?*

A. They are situated near the anterior part of the ventricles, and recede from each other posteriorly; their structure is cineritious externally, and mixed with striae of medullary substance within.

Q. Describe the structure and situation of the *Thalămi Nervorum Opticorum?*

A. Their structure is medullary on the surface, and striated within; their anterior parts are placed between the corpora striata; the Thalami lie with their flat inner sides contiguous, and are covered above by the commissūra mollis; the posterior parts of the Thalămi turn downwards and outwards, forming two white cords, called *tractus optĭci.*

Q. Where is the *Taenia Semicircularis of* HALLER, or the *Centrum Semicirculāre Gemĭnum of* VIEUSSENS, situated?

A. In the groove between the corpus striatum and the thalămus optĭcus of each hemisphere.

Q. What is the situation and nature of the *Choroid Plexus?*

A. It is spread over the thalami nervorum opticorum, and consists of a congeries of tortuous blood-vessels.

Q. Does the Plexus Choroides of the one lateral ventricle communicate with that of the other?

A. Yes; the plexus of each side communicates through the foramen Monroianum; and at the posterior and in-

ferior part of the fornix, where the impression of the vessels form the lyra.

Q. Where is the *Foramen* MONROIANUM situated?

A. It is situated under the body, and near to the anterior crura of the fornix; and seems to be occupied by the vessels of the choroid plexus in the living subject, so as to admit of no foramen; but in the dead subject, these vessels are empty, and the slender adhesions of cellular substance, which confined them in situ, are destroyed by putrefaction; hence an opening is manifest by the blow-pipe.

Q. How can it be proved that the vessels of the Choroid Plexus fill up the space, called foramen Monroianum, in the living subject?

A. Because dissection has shewn one lateral ventricle to be full of effused fluid, while the other was empty.

Q. Is not the effusion, or extravasation of blood, more frequently in both lateral ventricles?

A. Yes; in Apoplexy, a rupture of a vessel may take place in one lateral ventricle, and produce a distension sufficient to rupture the adhesions of the cellular substance around the vessels of the choroid plexus in the foramen Monroianum, and thus force a passage into the other.

Q. What is the situation of the *Fornix*?

A. It is situated in the mesial line immediately under the Septum Lucidum, and by some considered a continuation of the corpus callosum.

Q. Describe the *Fornix*?

A. It has a body, two anterior crura, and two posterior.

Q. Describe the *body* of the Fornix?

A. It is somewhat triangular, narrow anteriorly, and broader behind, where it is united to the corpus callosum.

Q. What is the direction and termination of the *anterior crura* of the Fornix?

A. The anterior crura being near together, form an angle at the anterior Commissure, bend downwards behind it, and either terminate in the Corpora Albicantia in

the base of the brain, or wind round the Thalami, and terminate in the crura cerebri.

Q. Describe the direction of the *posterior crura* of the Fornix?

A. They are prolongated, and follow the curvature of the inferior cornua of the lateral Ventricles, form a part of the Pedes Hippocampi or Cornua Ammonis, and their inner margin is fimbriated, and called Corpus Fimbriatum.

Q. Describe the Pedes Hippocampi?

A. They are composed of medullary matter externally, mixed with cineritious internally, commencing from the posterior crura, or pillars as they are sometimes called, of the Fornix; and from the sides of the posterior extremity of the Corpus Callosum, they are rather small at first, but increase in size towards their further extremity.

Q. Describe the *anterior Commissure?*

A. It is a medullary cord, which unites the anterior and inferior parts of the Corpora Striata; it is convex anteriorly, and its extremities are lost in the middle lobes of the brain near the fossa Sylvii.

Q. Where is the situation of the *Lyra?*

A. It is an impression made on the inferior and posterior surface of the Fornix by the vessels of the Tela Choroidēa; and it is best seen by reflecting the Fornix backwards.

Q. What is the situation of the *Commissūra mollis?*

A. It is the connexion of the two thalami optici above, where they form one continued medullary surface, called Commissura mollis, which covers the third Ventricle.

Q. Describe the situation of the *third Ventricle?*

A. It is in the form of a deep fissure, situated between the bodies of the Thalami optici, having the commissūra mollis above, and the crura cerebri and pons Tarīni below.

Q. Where is the situation of the *Infundibŭlum?*

A. Under the anterior part of the body of the Fornix at the foramen Monroianum, there is a passage called

foramen commune anterius, vulva, iter ad infundibulum, or *iter ad tertium ventriculum*, from which tho Infundibulum of considerable size descends obliquely forwards, gradually contracting, till it terminates in tho Glandula Pituitaria.

Q. Does the third Ventricle communicate with the Infundibulum?

A. Yes; at its anterior and superior part.

Q. What is the situation of the *Glandula Pituitaria*?

A. It is of on oval form, situated in the Sella Turcica; is cineritious without, and medullary within.

Q. What is the *use* of the pituitary gland?

A. Its use is unknown.

Q. What is the situation of the *posterior Commissure?*

A. It is something similar to a short cord, running transversely at the back part of the third ventricle, above the iter ad quartum ventriculum, and before the tubercula quadrigemĭna.

Q. Describe the situation of the *Tubercula Quadrigemina?*

A. They are situated at the posterior part of the third Ventricle, and behind the Thalami Optici: when the posterior part of the fornix and tela choroidea are removed, they come into view; or they may be seen by lifting up, and turning forward the posterior lobes of the brain.

Q. Have these tubercles any other name?

A. The two superior are called *Nates*, of a rounder form, and of a cineritious colour than the two inferior, called *Testes*, of a medullary colour, and longer laterally.

Q. Where is the *Glandŭla Pineālis* situated?

A. The Pineal gland is situated on the posterior Commissure, over the nates, and under the back part of the fornix, is of the size of a pea, and of a conical figure; its structure is cineritious.

Q. Where is the *Iter ad quartum Ventriculum*, Canalis medius, or Aquaeductus Sylvii, situated?

A. At the inferior and posterior part of the third Ven-

tricle, that passage is found running backwards and downwards under the corpora quadrigemina into the fourth ventricle.

Q. What is the situation of the CEREBELLUM ?

A. It is situated under the Tentorium in the fossae of the occipital bone.

Q. What is the general appearance of the Cerebellum ?

A. It is roundish, but broader from side to side, is marked by numerous convolutions on its surface, and is divided by the Falx minor into two hemispheres.

Q. Does it consist of cineritious and medullary matter, as the cerebrum ?

A. Yes; but the cineritious is more in proportion: the convolutions run transversely, and the alternations of cineritious and medullary substance are beautiful on cutting the cerebellum vertically; the resemblance of a tree is strikingly correct, and it has been called *arbor vitae*.

Q. What composes the *Tuber Annulare*, or *Pons Varolii* ?

A. The junction of the crura cerebri and crura cerebelli.

Q. Where is it situated ?

A. The *Tuber Annulare* is situated on the back part of the sphenoid, and on the cuneiform process of the occipital bone.

Q. Where is the fourth Ventricle situated ?

A. Between the Cerebellum, the under part of the Tuber annulare, and upper part of the Medulla Oblongata, the Valvula and Velum VIEUSSENII closes the intermediate spaces, and completes the cavity.

Q. What is meant by the *Medulla Oblongata* ?

A. The medullary substance from the Tuber annulare to the foramen magnum becomes conical, and is generally called Medulla Oblongata.

Q. What is worthy of observation on the surface of the Medulla oblongata ?

A. Four longitudinal eminences; the two *Corpora*

Pyramidalia lying contiguous in the middle, and the two *Corpora Olivaria* on each side.

Q. Where does the Medulla oblongata terminate?

A. Whenever it passes through the foramen magnum, it gets the name of *Medulla spinalis.*

PHYSIOLOGICAL REMARKS ON THE BRAIN.

Q. What is the *use* of the *Brain?*

A. It seems the medium through which the mind and body affect each other; it may be said to be the receptacle of sensation, and the instrument of thought; or the seat of the intellectual faculties.

Q. Have the various parts of the Brain their particular and individual functions to perform?

A. It is very probable that they have; as we see the nerves of the different senses arising from different parts of it; so the different portions of brain may contribute to the manifestations of mind.

Q. Have the different offices of particular parts of the brain been ascertained?

A. Various attempts have lately been made by Drs Gall and Spurzheim, and their followers, to ascertain this; but we cannot with full confidence rely upon their conclusions being true; much observation is still wanted upon this head.

Q. Does the power of the intellectual faculties depend on the bulk of brain?

A. Brain in the human species bears a much larger proportion to the Spinal Marrow, than in animals; hence the superior intelligence of man must depend upon his quantity of brain.

Q. Does the difference of the quantity of brain then constitute the different degrees of intelligence among men?

A. No; a certain quantity of brain is essentially necessary; but it is on the just and requisite proportions of the different parts of brain to each other, and on the cultivation of the mental powers dependent upon these

parts for their manifestation, that the different degrees of intellect seem to depend.

Q. Does intelligence, or even instinct, depend on a relative proportion between the brain and spinal marrow?

A. Yes, it seems so; for as the size of the brain diminishes, and that of the spinal marrow increases in animals; in the same ratio, instinctive intelligence decreases, while acuteness of feeling, and rapidity and strength of their motions increase.

Q. What movements does the brain exhibit on being denuded?

A. One which keeps pace with the arteries; another with the organs of respiration.

Q. Do the cerebrum and cerebellum undergo any pressure?

A. The quantity of blood sent into them produces considerable pressure; the pia mater by its contraction produces the same effect upon the spinal marrow, which does not, as the brain and cerebellum, fill exactly the bony case, which incloses it. This pressure is necessary to these organs, as if it is suddenly augmented or diminished, their functions cease.

OF THE FUNCTIONS OF THE BRAIN.

Q. What are the functions of the brain?

A. They are all modifications of feeling; and are arranged under four heads. 1. Sensibility, or that by which we receive impressions. 2. Memory, or the faculty of reproducing these impressions. 3. Judgment, or the faculty of perceiving relations between sensations. 4. The Will.

OF THE SENSIBILITY.

Q. How many modes of this state of the mind are there?

A. Two; one which arises from the effect of an external object on one of the senses, called a perception;

another which arises from the recollection of these impressions, and is called an idea.

Q. Is sensibility different in different persons?

A. It differs in different persons; in some it is obtuse; in others lively; in youth it is strong; in old age it is obtuse.

OF MEMORY.

Q. Describe the qualities of this faculty?

A. It consists in the power of re-producing ideas which have been before in the mind; it is more strong and lively in youth; it debilitates as we grow older, and in old age is almost entirely gone.

OF JUDGMENT.

Q. Describe this faculty?

A. It is the most important of all; by it we acquire all our knowledge, and direct ourselves through life; it consists in observing the relations between the phenomena of nature, and tracing their causes, and appropriating to each its due degree of power. A train of judgments is called reasoning; and in proportion as these are correct is the individual happy, or otherwise, in his arrangements, to produce comfort and contentment with his situation. Thus, if a man believes that arsenic is sugar, and takes it for that substance, he might destroy himself; so it is with regard to all other ideas and actions, as crimes, vices, bad conduct, &c.

Some men are endowed with the happy faculty of perceiving new relations between things, and thus benefit greatly their species; they are called men of genius; if they have less of this faculty they are said to have talents.

Strength of judgment is impaired by the vivacity of our thoughts; it is on this account that judgment grows better with age.

OF THE WILL.

Q. Describe this faculty?

A. It means that modification of thought by which we have desires which are generally consequent on some act of judgment, and are intimately connected with our happiness; for if our desires are not gratified we are unhappy; on the contrary, the science of morals consists in giving a proper direction to our desires, so as to produce happiness. These four faculties, by properly combining and acting upon each other, constitute intelligence in its highest grade; of which the most elevated is the faculty of generalization, or abstraction, by which facts are arranged under general rules, or laws, so that the properties of all bodies, to which the rule applies, may be known at once by consulting the rule. In this manner a knowledge of vast regions of nature may be facilitated by the knowledge of a few principles, couched in a few short sentences, which are the result of this principle of abstraction. The development of this talent is much favoured by an easy mode of life, and on the contrary is retarded when it is difficult, as among savages, slaves, &c.

Q. What is meant by instinct?

A. Certain desires, by which the different parts of the animal machine are naturally excited to action to satisfy certain wants?

Q. How many kinds of instinct are there?

A. Two; one in which the desire to be gratified exists, with a knowledge of the end to be gained; the other without that knowledge; the former is more particularly found in the human species, the latter in brutes.

Q. What is to be considered with regard to the end or final intention of instinct?

A. There are two things; first, the preservation of the individual; secondly, the preservation of the species.

Q. How many kinds of instincts are there in man?

A. There are two kinds: one belongs to his nature,

considered merely as an animal, as those which regard thirst, hunger, the want of clothes, dwellings, the fear of pain and of death, venereal desires, the love of offspring, the tendency to imitation, to live in society; the other kind of instinct arises out of the social state, such as the gratification of ambition, of vanity, of fortune.

Q. What is the object of the passions?

A. They have the same end or object as instinct; and may be divided into the animal, or those which have for their object the preservation of the individual and of the species; to which belong fear, rage, anger, hatred, excessive thirst; to the preservation of the individual belongs jealousy; rage when the family are attacked.

The other divisions are those of the social state, as hatred, anger, vengeance, violent love, &c. It is strength of passion makes men great. All great heroes, great criminals, great poets, and orators have had strong passions.

Q. How are these passions expressed?

A. By actions, gestures, and the voice; the two latter with the operation of the mind, form the science of eloquence, and as far as the peculiar expression of the voice, and its various modifications of sounds are concerned, it has been elaborately and perspicuously analyzed by Dr James Rush, whose labours on this subject, as they give a reality to eloquence as a science, have conferred a great honour on his country.

The extent of the investigation, and its connection more with the expression of the passions than physiology as a science, must, of course, prevent its consideration here.

METHOD OF EXAMINATION APPLICABLE TO DISEASES OF THE HEAD.

Q. When disease of the brain is suspected, can any light be thrown upon the question by examining the other organs of the body?

A. The brain, like all the principal organs of the eco-

nomy, presents, when attacked by disease, a disturbance, more or less evident, of the functions over which it presides; hence it is to these functions (at the head of which we place the intellectual faculties, and those which belong to the systems of sensation and locomotion,) that the observer ought particularly to direct his attention. The digestive apparatus should next be attended to, as its sympathetic connexions with the brain are so many and so important. As to the circulation and respiration, they are but very indirectly and rather remotely influenced by affections of the organs now under consideration. The expression of the countenance, and the position of the patient should always be attended to whenever the brain is affected. Before we enter on each of these subjects in detail, it will be necessary to say a few words on some precautions which should be observed, and which precede the examination of the symptoms.

Q. What other points deserve attention?

A. As the diagnosis of diseases of the brain is in general difficult, and as several of them may be confounded with one another, or with affections of other organs, it is particularly necessary to attend to the previous history of each case, as it will elucidate the manner in which it set in, its progress, changes, the state of other organs coincident with these changes, more particularly that of the digestive apparatus. The observer will thus avoid the several mistakes which arise from the resemblance that exists between acute inflammations of the brain, and some derangements of the digestive tube. He should also attend to the nature of the causes which have induced the affection of the brain; he will recollect how constantly they are produced by concussion of the cranium, or vertebral column, insolation, hypertrophy of the heart, acquired and hereditary dispositions to cerebral congestion, abuse of spirituous liquors, the use of narcotics, mental anxiety, &c.

In every case the skull and spinal column should be examined, to ascertain whether there be any malforma-

tion, tumour, or lesion to which the present affection may be referred. If the patient be a child, the temperament should be noted, and the size of the head, if it be large; the existence of worms, and the time that has elapsed since dentition. Increased vigilance will of course be required, if any organ of the thorax or abdomen be engaged, for then the cerebral affection may be obscured and masked by the other disease. After these preliminary inquiries, we may now enter on the examination of each of those systems of organs to which we have already alluded, and which we now proceed to consider in detail.

Q. How far do the intellectual faculties contribute to develope the state of the brain?

A. It is usual to commence by ascertaining the state of the patient's faculties when he was in health, in order to distinguish what is really caused by the disease. Questions should then be put to the patient, to learn how far his intellects are impaired. His answers will determine whether his faculties are, as it were, exalted, deranged, or, on the contrary, merely weakened. To the two former heads may be referred that delirium, which is termed hallucination, when it takes one particular direction.

Q. What varieties of delirium are there?

A. Delirium is presented to us in a variety of forms, for sometimes it is manifested only by a change in the patient's character: for instance, making a man habitually serious to become gay, or a mild and calm person to be impatient, irritable, or vicious; sometimes it is marked by a sombre, or even savage expression, by phrenzied exclamations, singing, loquacity, incoherent expressions, ideas of the wildest ambition, a real state of mania; at other times there is an incoherence in the answers, some of which may be correct enough, while others are confused, and destitute of meaning; and lastly, the patient may be in a state of extreme agitation, making continual efforts to escape from his bed. In general, the degree of the delirium is proportioned to that of the general reaction in acute cases, and varies as this latter does.

The delirium may be continued or intermittent, periodic or irregular, subject to particular influences or returning without any assignable cause. A better idea of the patient's case may, in some instances, be given by citing some particular word or phrase of his, than by any general description, for these are often peculiarly expressive. These circumstances, which generally concur with other indications of excitement, are referible to irritation of the brain; but they may also depend upon a reaction of such organs as sympathize with the brain, particularly the digestive tube. This is the reason why we have above insisted so much on the necessity of having a perfect knowledge of the manner in which these diseases set in. In infancy, as the intellects are not developed, it can scarcely be said, that there is delirium; hence, we must attend to the other cerebral symptoms.

We have already said that there is an opposite state to that here described, and which depends on diminished action, and loss, more or less, of cerebral power. This state is, in most cases, consecutive on the former; in others, however, it sets in suddenly, and indicates that the organization of the brain has been deranged from the commencement of the attack. This is marked by slowness and difficulty in giving answers, drowsiness more or less, and then somnolence, which may increase to a state of profound carus. Its degree should be stated; whether there be merely a disposition to drowsiness, or to actual coma, or whether it is possible to rouse the patient by stimulation. This may be ascertained by pinching different parts of the body, or by making slight percussion on the arm, or even the face, by which we may form some estimate of the condition of the nervous sensibility.

Q. What other faculties deserve attention?

A. Some attention should be directed to ascertain the state of the memory, and the mode of articulation. The utterance may be hurried, quick, impeded, or even altogether suppressed; in which latter case, it will be well to ascertain whether the aphonia arises from an impediment

to the free motions of the tongue, or a want of cerebral power, caused by a lesion of some part of the brain.

Q. What symptoms are to be derived from the sensitive system?

A. This may be divided into two great heads, the organs of sense, and the general sensibility.

The symptoms, most usually observed, are referrible to disturbance of the sight, hearing, and touch. There may be a greater or less degree of diminution in these functions, or, on the contrary, an exaltation of them; or finally, there may be aberrations or illusions. When there happens to be a diminution, or complete suspension of the power of hearing or seeing, as in coma, for instance, we ought to ascertain whether it is real, or only apparent. This can be done by suddenly exposing the eye to a strong light, or the ear to a loud sound.

Though the senses of smell and taste seldom furnish any assistance to the diagnosis of diseases of the brain, still we may examine their condition by bringing some pungent odour in contact with the pituitary membrane, or placing on the tongue some sapid substance.

In diseases of the brain, the sensibility is variously affected, and requires very particular attention. As to the eye, its sensibility may be increased, which depends either on the impression of the air on the conjunctiva, in which case, if there be opthalmia at the same time, it becomes necessary to state it, or on the stimulus produced by the light on the brain, through the intervention of the retina; these two causes should be carefully distinguished.

By tickling the interior of the nasal fossae and the surface of the tongue, we may determine whether their sensibility (considered as a result of the sense of touch generally diffused over the body), remains unimpaired.

The nature and character of the headache should be particularly attended to, as it is one of the most constant symptoms; it will be necessary to ascertain exactly whether pain is felt in the internal ear, and also if there be any discharge from the auditory tube, which is some-

times of consequence as indicating an alteration on the lower surface of the cerebellum.

The sensibility of the limbs is sometimes increased, which is marked by shooting pains, by painful numbness, and creeping, which follows the course of the large nervous trunks; this increased sensibility exists sometimes in the muscles also, particularly when they are permanently contracted. In such cases we ought, as far as is possible, to indicate the tissue affected.

As to the sensations of creeping, numbness, or of different "aurae," which occur in the limbs during the course of certain affections of the brain, they require a careful examination to determine in what tissue they commenced, or whether the skin only is engaged.

The state of the sensibility should then be ascertained in the different regions of the body, particularly in the chest and abdomen, and upper and lower extremities. This examination is so much the more necessary, as in inflammation of the central parts of the brain, for instance in the corpus callosum, septum lucidum, and fornix, the sensibility is sometimes so much increased in the integuments of the body that the slightest pressure produces pain: this should be distinguished from inflammation seated in the abdomen itself.

When the opposite state, or that of diminished sensibility takes place, as in the case of effusion, or disorganization of the substance of the brain, the different parts of the body should be examined, as has been above stated, and we ought to have recourse to *pinching*, in order to determine the degree in which the sensibility is diminished. In all such cases comparative trials should be made at both sides of the body, and the result stated in the report.

Q. What is to be learned from the state of the apparatus of locomotion, with regard to the state of the brain?

A. Its examination should follow that of the sensibility. After commencing with the face, the state of the eyes, mouth, neck, and limbs, should be successively reviewed.

The part of the eye which should be most attended to is the pupil, which may be either dilated or contracted, immoveable or dilatable, or, in some cases, may present constant oscillations.

The globe of the eye itself may be agitated by convulsive or rotatory motions, or may present a change in the direction of its axis, constituting strabismus.

This last phenomenon depends upon a permanent contraction of the muscles of the eye, at the side affected, or on paralysis of their antagonists. The eye-lids may be closed, which depends either on a paralysis of the elevator of the upper lid, or of the contraction of the orbicularis muscle, which ought always to be stated. The contraction of this latter muscle, which is produced by the effect of the light on the eye, should not be confounded with that spasmodic effect, which is altogether involuntary, and depends on a deep-seated irritation in the brain.

The alae of the nose are in some cases immoveable at one side, and applied closely to the septum. This arises from paralysis of the muscles at that side, and therefore deserves to be noted.

When the utterance is impeded, indistinct, or altogether lost, we should ascertain, whether it arises from difficulty of moving the tongue, lips, or larynx, or whether it depends on want of cerebral power. For this purpose we should endeavour, by calling aloud to the patient, to excite to action the different sets of muscles that contribute to the act of speaking.

As to the mouth, it presents several symptoms deserving attention. They consist of trismus or tonic contraction of the elevators of the lower jaw: the direction of the point and base of the tongue may be changed, or the position of the commissure of the lips may be altered; this latter deviation sometimes takes place on the affected side, in consequence of a spasmodic contraction of the commissure, which draws the mouth upwards and outwards; at others the muscles are paralysed, when the lip becomes depressed and pendant; finally, it may exist at the same side, and be caused by the muscles that re-

main unaffected. In general, when there are any spasmodic attacks, the examination of the commissure of the lips, as well as of the other muscles, should be made during the intervals, for while they continue, the two sides being sometimes convulsed, it will not be possible to ascertain the distinctions above stated.

The head is sometimes drawn backwards, or inclined to one side: attention should then be paid to the muscles of the neck, which are contracted or relaxed. In some cases, the larynx experiences continued motions up and down.

The trunk of the body may also present particular phenomena, such as momentary spasms of the muscles of respiration, retraction of the body backwards, or bending forwards; these latter usually depend on irritation in the spinal column.

The power of moving the upper and lower limbs, particularly the former, may be diminished or lost. This paralysis, which may exist with or without rigidity, depends, according to some writers, on a lesion of the optic thalami and posterior lobes of the brain, or of the corpora striata and anterior lobes; the former, namely that of the optic thalamus, determines paralysis of the upper extremities, the latter, namely that of the corpora striata, produces paralysis of the lower limbs. We should ascertain whether the immobility of the limbs arises from a state of inaction or general weakness, whether it is confined to a certain region, or extends to all; whether the limbs retain any position that may be given to them, as in catalepsy; or whether, on the contrary, there is a real paralysis. When this latter exists, we should examine whether the muscles are flaccid or rigid, whether the flaccidity is total or partial, or whether the limb falls down *en masse* when it is raised: when rigidity exists, we should ascertain whether it is confined to one part, as in trismus, or extends to the whole body, as in tetanus. In some cases the muscles are alternately in a state of rigidity and relaxation, as in convulsions; in others, the limbs are continually agitated, as in chorea, the intellect remaining unimpaired, but incapable of controlling the

motions. And lastly, the convulsions exist in certain muscles only (and then momentarily), producing *subsultus tendinum*. We may here observe that those irregular motions which occur during delirium, should not be considered as convulsions, as they have a real object, and do not belong to movements merely involuntary. As to those motions which are termed automatic, they should be noted; such, for instance, as when children in hydrocephalus carry their hands frequently to their heads. In the exposé of these various phenomena, any differences that may exist between the state of the two sides of the body should not be overlooked.

Q. What is to be learnt from the digestive system?

A. The digestive organs do not ordinarily present many symptoms which may be considered as the direct effect of diseases of the brain. The most important, however, are vomiting, which sometimes occurs at the commencement of these affections, constipation and retention of urine, or the opposite state of involuntary evacuation, which occurs when the affection is carried to a great degree, or when the spinal column is engaged. When there is vomiting, care should be taken to examine the state of the mouth and tongue, as well as the abdominal viscera, in order to determine whether it is purely symptomatic of the affection of the brain, or depends on inflammation of the stomach.

Q. What is to be learnt with regard to the diseases of the brain from the circulating system?

A. The disturbance referrible to this part of the economy, consists in alterations of the natural rythm of the pulse, in increased frequency, or a greater or less degree of slowness. Sometimes it may become irregular or intermittent; but this latter modification is of trifling importance, as it contributes little or nothing to the diagnosis of cerebral affections. We may remark, however, that slowness of the pulse is chiefly connected with certain lesions of the substance of the brain, and with considerable effusions, whilst increased frequency accompanies rather the inflammatory condition of the membranes, and the first stage of inflammation of the sub-

stance of the brain, particularly when this is complicated with gastro-intestinal inflammation.

Q. What is to be learnt with regard to the brain from the organs of respiration?

A. We may make somewhat the same remark on this system as on that of the circulation, as to the degree of its connexion with affections of the brain. The respiration may be stertorous, interrupted, sighing, elevated, or may become very slow, when the disease proceeds to an extreme degree. It becomes laborious and difficult when the spinal chord is injured, in a greater degree in proportion to the nearness of the affected part to the region of the neck; and suffocation may be threatened if it occurs opposite the fourth and fifth cervical vertebrae, below the origin of the phrenic nerves. In some cases the expiration is made at one commissure only, the mouth being closed; this is what has been termed "*fumer la pipe.*" After having in this way reviewed the different systems of organs, the narrative may conclude with stating the position of the patient's limbs, as well as that in which he lies.

Q. What is to be known with regard to the brain from the urinary system?

A. The state of the bladder should never be neglected; it is sometimes paralyzed. The secretion is then retained in the bladder, acquires an ammoniacal fetor, is absorbed into the system, and produces that peculiar fetor so common in affections of the brain, which has been compared to the smell of mice. The urine may be thready and mixed with mucus, arising from inflammation of the lining membrane of the viscus, caused by the retention of the fluid in its cavity. When the spinal column has sustained any injury, particular attention should be paid to the urinary organs, as paralysis of them is one of the most constant effects of the diseases of the medulla spinalis.

Q. How does the countenance indicate disease in the brain?

A. The examination should conclude with a slight notice of the countenance, which may be described either

in reference to its general expression, (which may be furious and menacing, or merely fixed and denoting surprise), or to each of its parts; thus the eyes may be red and brilliant, or dull and covered with mucus; the upper lids may be contracted, moveable, or paralyzed; the mouth may present a deviation at its commissure; hence the great variety of expression which the countenance presents in diseases; it may be tranquil, immoveable, gay or gloomy; or it may express indifference, stupidity, or total insensibility.

Q. How do the position and state of the body indicate disease of the brain?

A. The manner in which the patient lies, the state of agitation or calm in which he is found, the position of the head and limbs, the disposition to sink down in the bed, &c., may furnish some data for distinguishing the diseases of the brain. Finally, when there is any reason to suspect an affection of the cerebellum, when the patient presents any external marks on the occiput, or when he complains of pain in that part, attention should be directed to the genital organs, to see whether there be priapism.

Q. Recapitulate what has been here said?

A. We see that the observer should attend to the age of the patient, which in some cases will assist in distinguishing apoplexy from inflammation of the brain, as the former seldom occurs before the age of forty, while the latter may arise at any period of life. He should examine the skull and vertebral column, to ascertain whether there is any external injury or malformation; he should attend to the mode in which the disease has set in, its progress and symptoms; then he should examine the present condition of the patient, commencing with the intellectual functions, having in the first instance ascertained their state in health. Delirium and its character should next engage his attention, and also the state of stupor, which may vary from mere somnolence to complete coma; from a slight slowness in answering questions, to total loss of understanding. The manner of articulation should also be attended to.

After inquiring whether there is any pain or particular sensation in the head or vertebral column, the examination concludes with a review of the organs of sense, as the sight, hearing and taste.

The observer then passes in review the state of the pupils, of the globe of the eye, eye-lids, lips, tongue, neck, upper and lower limbs; he then examines the muscular system, to determine whether there is contraction, convulsion, or paralysis in any particular part; or whether these phenomena are continued or intermittent. In drawing up the report of the case, he will follow precisely this same arrangement.

After having thus investigated the condition of the three great functions which are affected by affections of the brain, the observer will ascertain the state of the tongue, stomach and bowels; he will state the existence of constipation or vomiting, and mark their symptoms, with so much the greater accuracy, as affections of these organs very frequently simulate those of the brain. He may conclude with a rapid glance at the state of the respiration, the pulse, action of the heart, state of the bladder, expression of countenance, and position in which the patient lies.

When the medulla spinalis or cerebellum appears to be affected after some external injury, attention should be paid to the digestive, respiratory, circulating and digestive systems. But that the report of the case may not be incomplete, he should examine the whole of the viscera, and state whether they present any thing remarkable. This is the only way by which complete and accurate cases can be drawn up, capable of still farther elucidating the pathology of the brain, which has latterly made so much progress.

DIAGNOSIS AND PATHOLOGY OF DISEASES OF THE BRAIN AND ITS MEMBRANES.

FUNGUS OF THE DURA MATER.

Q. What are its symptoms?

A. This disease is of rare occurrence, but is not confined to any particular period of life. It may sometimes exist without occasioning any derangement of function, or if it manifests any symptoms, they are so obscure as scarcely to indicate its existence. But after some time, probably during the progress of an old syphilitic taint, or in consequence of a contusion of the head, violent headaches occur, which may be either dull or lancinating, continued or intermittent, and occasionally accompanied by epileptic, comatose, or paralytic symptoms; at length a tumour begins to appear, the seat of which may be either at the roof or base of the brain, or sometimes in the orbit. This production is more or less hard, indolent or very painful, increases rather slowly, and exhibits a sort of pulsatory motion. It may at times be reduced altogether, or in part, within the walls of the cranium, and then we can distinctly trace the margins of the aperture through which it had escaped, which we find to be rough and irregular. Pressure, directed from above downwards on the tumour, gives rise to paralytic or comatose symptoms, for by this means it is made to compress the brain; but if we press it from side to side between the fingers, no particular effect is produced, or at most, only a slight degree of pain, for then no impression is made on the substance of the brain. Sometimes the cerebral symptoms cease altogether after the tumour has escaped beyond the cranium.

Q. What are the diseases with which it may be confounded?

A. This affection may, in its first stage, be confounded with any of the derangements of the brain or its investments; in the second, with encephalocele—with vascular tumours of the dura mater, following wounds—with

abscess—with certain wens, or with aneurism of the occipital or temporal arteries.

Q. What are its Anatomical Characters?

A. These tumours are fibrous in their texture, sometimes crossed by enlarged blood-vessels: in some points they become softened and broken down, and contain blood effused into their substance. In some instances we find only one of them, in others several, which may be encysted, circumscribed, and more or less irregular. At first they are flattened before they escape beyond the skull, afterwards assume the form of a mushroom, the pedicle corresponding to the aperture in the cranium. The margins of the opening are eroded, and in many cases present asperities, which, by pressing against the tumours, excite intense pain.

ENCEPHALOCELE.

Q. What are its symptoms?

A. In this affection, we find a soft, round tumour, which pulsates synchronously with the arteries, is little if at all painful, diminishes or altogether disappears on pressure, but is increased by crying, coughing, sneezing or forced expiration. It does not produce any change of colour in the skin, nor is it attended by any marked cerebral symptoms, unless when complicated with other affections: it is most common in children, particularly at an early period after birth, and then makes its appearance at the fontanelles or sutures, when the ossification is retarded: it may, however, occur at any time of life, after caries of the bones or wounds, with loss of substance. Pressure directed in any direction upon it, either from above, downwards or from side to side, induces symptoms of coma, paralysis or spasm, which at once distinguishes it from tumours of the dura mater. The margins of the opening through which it escapes, can be ascertained by examination sufficiently to distinguish it from tumours seated on the surface.

Q. What are the diseases with which it may be confounded?

A. In infants it may be mistaken for sanguineous congestions—in adults, for fungus of the dura mater.

Q. What are its Anatomical Characters?

A. Congenital encephalocele is generally formed by the cerebrum, seldom by the cerebellum; it is enclosed either in the meninges of the brain, or, after these have been destroyed, in the integuments of the cranium; when this is the case, various alterations take place in the protruded portion of the brain, and effusions of various descriptions are, in most instances, poured into the sac which contains the tumour. In accidental encephalocele, the dura mater is more or less thickened and altered, and sometimes becomes adherent to the hairy-scalp, in which case the brain is almost always healthy.

INFLAMMATION OF THE DURA MATER.

Q. What are its symptoms?

A. This inflammation rarely occurs except as a consequence of severe contusions of the skull, or wounds with loss of substance of its bony arch. It gives rise to violent headache, and is often complicated with arachnitis, encephalitis, or with effusions of blood. The greater number of cases are accompanied by paralysis; which, when it does occur, is preceded by rigors, but not by delirium or any spasmodic affection. This paralysis is observed usually on the side opposite to that which is the seat of the contusion, and is more or less partial, according as the effusion covers a greater or less extent of surface. In cases of fracture of the skull, when there is a perceptible interval between the bones, pus will flow out, and if there be a loss of substance sufficient to expose the dura mater, it is easy to ascertain its inflammation by the cellular and vascular masses developed on its surface, and by the pus which flows from them.

Q. What are the diseases with which it may be confounded?

A. They are, arachnitis, effusions of blood consequent on external injuries, fungous tumours of the dura mater, during their first stage, and also that of some cancerous affections of the brain.

Q. What are its Anatomical Characters?

A. The membrane presents a degree of redness, more or less intense, together with some vascular masses developed on its surface, which sometimes unite with similar productions on the bones, and inflamed integuments, and in some instances pass into the state of cartilage or bone; the membrane also becomes thickened, and occasionally exfoliates; pus is effused on its surface, particularly towards the lateral parts, where it becomes accumulated.

ARACHNITIS *(Cerebralis).*

Q. What are its symptoms?

A. The characteristic symptoms of this inflammation vary according as it is seated on the convexity of the brain, at its base, in the ventricles, or according as it is acute or chronic; hence it is necessary to consider each of these cases separately.

Q. What are the symptoms of Arachnitis of the Convexity of the Brain?

A. This occurs most commonly in persons from the age of fifteen to forty years; its causes may be divided into those which act directly on the head, such as contusions, insolation, burns, erysipelas of the scalp, and those which predispose to inflammation, such as suppression of sanguineous discharges, abuse of spirituous liquors, co-existence of inflammations of the other serous membranes. It begins with headache, the seat of which is variable, it soon becomes violent, the temperature of the head being at the same time very much increased, the face suffused, and the conjunctiva of the eyes injected. Vomiting sometimes occurs at this period, either spontaneously or excited by drinking; we do not, however, observe any other symptom of gastritis; there is much restlessness and agitation, the sensibility

of the eye is much increased, the mode of pronunciation is altered, the expressions are short, memory deceptive, movements hurried, with general fever. After some time the headache is succeeded by delirium, which is connected with this state of general re-action of the system; the delirium, however, is not constant, it ceases occasionally when the headache recurs, is attended with irregular though still voluntary movements, gives to the countenance an appearance of dullness and stupor, such as occurs in intoxication, or determines a general diminution of the sensibility. Finally, the arachnitis passes into its third stage, which is marked by immobility of the pupils, suspension more or less complete of the mental faculties, as well as of the general sensibility; in a word, by those symptoms which indicate a change from a state of disordered intellect to that of entire destruction of it. This state of coma is usually joined with trismus, or (though less frequently) with subsultus tendinum of one or other of the arms; in other instances we find a rigidity of the muscles, with or without convulsions, which may attack both sides of the body, but more frequently the upper extremities. These different symptoms are succeeded by a state of general relaxation, which immediately precedes death. Inflammation of the arachnoid seems in some cases to commence with one of the latter stages, without having exhibited any of the symptoms of the first.

When arachnitis is caused by a contusion, it may be followed by a paralysis of one side of the body. The hemiplegia, however, does not occur before some days have passed, as it is always gradual in its approach, being preceded by delirium, and the other symptoms above enumerated.

In lymphatic subjects, and in those who are weak and not capable of much re-action, disturbed dreams may occur instead of the delirium, and a state of general prostration may become the chief character of the disease. In such cases also, the coma is more sudden in its occurrence, and the stupor is more decided, though

the cerebral and febrile symptoms are in general less strongly marked.

Q. What are the symptoms of arachnitis of the ventricles and base of the brain?

A. This inflammation is considered as peculiar to infancy; but if it does occasionally occur in adults, it is found connected with that of the convexity of the brain. It is marked by headache, generally confined to the forehead and temples, which is accompanied by fever, depression, and general languor; sometimes by spontaneous vomiting, and somnolence more or less constant, without any disturbance of the intellect. These phenomena are usually succeeded on a sudden by a complete loss of the general sensibility of the intellectual functions and senses, together with spasm of both sides of the body, which may be either continued or recurring in fits of variable duration, and manifested chiefly in the eyes, mouth, and upper extremities. We also sometimes have occasion to observe the head drawn backwards, which indicates that the part of the arachnoid which covers the pons Varolii is engaged in the inflammation. In some cases during the progress of this inflammation, remarkable remissions occur, but are speedily succeeded by new convulsive and comatose symptoms, until at length the comatose state becomes fixed and constant, accompanied by a complete relaxation of the limbs, together with, in general, a remarkable slowness of the pulse. In this latter period, the pupils of the eyes are considerably dilated.

In adults, languor and somnolence occur in place of the spasmodic symptoms manifested in children; there is also a greater or less degree of weakness and inactivity of mind, but no delirium; the patient replies correctly to questions put to him, and may speak rationally when roused; but after some time coma and relaxation of the limbs go on increasing until the fatal termination of the disease takes place.

Q. What are the symptoms of chronic arachnitis?

A. Sanguineous congestions, either continued or frequently repeated, precede and accompany this affection;

its progress is essentially slow; its symptoms at the commencement are not strongly marked; they all, however, partake somewhat of the character of those already detailed in the previous section. At first the power of articulation is somewhat impeded, and when the inflammation begins with the arachnoid of the convexity of the brain, which usually is the case, the ideas are somewhat incoherent, the gait vacillating, and the limbs agitated by continued tremblings; the disturbance of the intellect, though slight at first, makes a slow but constant progress, until at length it ends in absolute maniacal delirium. According to Bayle, who first described this form of arachnitis, the chief characters of the delirium which accompanies it are, a "heightening and exaggeration of all the ideas, particularly those of ambition." After some time this state of phrenzy gradually subsides into one of fixed mental alienation; the power of articulation is impeded or totally lost; and finally, idiocy and general paralysis occur during the last stage of the disease, which still may last several years, during which the organic functions, such as digestion, respiration, and circulation may be regularly performed, though the paralytic symptoms, and the derangement of intellect go on progressively increasing. In some cases we observe, towards the close, spasms, accompanied by total loss of intelligence; these may be continued or periodical, or they may recur at irregular intervals.

We cannot conclude this description of arachnitis without remarking, that when it happens to be complicated with inflammation of the thoracic or abdominal viscera, the cerebral affection is rendered much more obscure, and therefore requires a more careful examination, in order to ascertain its existence.

Q. With what diseases may it be confounded?

A. Some other affections may be confounded with inflammation of the arachnoid membrane; thus permanent congestions of the pia mater, encephalitis, and ataxic or nervous fever, may be mistaken for arachnitis of the convexity of the brain; dropsy of the ventricles, "ramollissement," or softening of the hemispheres of the corpus

callosum or cerebellum, and adynamic or putrid fever, may be mistaken for that of the base: and finally, hydrocephalus, and several chronic alterations of the brain, may be taken for chronic arachnitis.

Q. What are its anatomical characters?

A. The different regions of the arachnoid membrane do not seem equally susceptible of inflammation. The following appears to be the order of its frequency in them; on the convexity of the hemispheres, at the decussation of the optic nerves, in the interior of the ventricles, at the pons Varolii; and lastly, on the internal flat surfaces of the hemispheres. When the arachnitis has lasted only a few days, and has been slight, the membrane presents no perceptible change, it remains as thin and transparent as in the natural state, and cannot be detached from the convolutions without being torn, and therefore cannot be separated without the greatest difficulty from the pia mater. The redness and increased consistence which it appears to possess in this stage belong altogether to this latter membrane, whose cellular tissue is thickened, and vessels considerably injected. At a more advanced period of the affection, the arachnoid acquires a real increase both of thickness and density; it loses its transparence, and presents somewhat of a milky appearance. These different states are marked in proportion to the duration and intensity of the inflammation: still the thickening is never so great, nor is the change so decided as to give to the arachnoid the appearance of the pleura; it may, however, be easily detached from the pia mater, in fragments of sufficient extent to point out its change of structure, and show that this increase of thickness is not owing to the cellular filaments that adhere to it. The pia mater is in such instances injected: the cellular tissue under the arachnoid, and that which connects the different vessels, are injected with a serous or albuminous fluid, so intimately combined with them, as to give them the appearance of a single membrane, thick and whitish, from which by pressure a seropurulent fluid may be made to exude. These characters are presented by the pia mater in a greater or less extent on

the brain, particularly towards the superior part of the hemispheres. In parts where the sub-arachnoid tissue is rather loose and abundant, for instance between the convolutions, in the fissure of Sylvius, and more particularly opposite the pons Varolii and decussation of the optic nerves; this serous liquid, by being infiltered into the meshes of the tissue, gives it the appearance of a gelatinous fluid diffused on the surface of the brain. Sometimes under the arachnoid there is a layer of pus, particularly when the inflammation has been determined by a contusion of the head; more commonly, instead of pus, is found a serous or sero-sanguineous fluid. In some cases the arachnoid is covered with false membranes, more or less thick, and more or less extensive; but it is rare to find adhesions between the two layers of the membrane, and still more rare to find the inflammation confined to its cranial layer; when, however, it does occur, it requires care to determine whether the redness is seated in the serous membrane, or depends on the injection of the pia mater; adhesions of the pia mater to the substance of the brain are, on the contrary, very common. Finally, the arachnoid, particularly that of the ventricles, may lose its polished appearance, become rough, and covered with small granulations, which, when very minute, make it appear as if covered with down; they however can be distinguished, when examined in a clear light. When these granulations are seated on the upper part of the hemispheres, care should be taken not to mistake them for the glandulae Pacchioni, which are always larger, whiter, more numerous, and in closer contact. A similar mistake may be caused by the presence of air-bubbles beneath the pia mater, but this is easily removed by detaching the membrane from the surface of the brain. The arachnoid and pia mater may be both altogether destroyed, by inflammation extending to the substance of the brain. In other instances, we find in the substance of the membrane small white lamellae, thicker at their centre than towards their circumference, at first sight resembling a soapy fluid diffused on the surface; but on closer examination, they are found to

approach very much to the consistence and structure of cartilage.

To conclude, we find frequently in the ventricles serous, sero-sanguinolent or sero-purulent effusions, which are more abundant as the inflammation approaches the base of the brain, or occurs in the ventricles themselves. In such cases, more especially in children, the portion of the brain that forms the walls of the lateral ventricles is softened to a greater or less extent; this is particularly observable in the digital cavity, fornix, and corpus callosum. This "ramollissement" may be so great as to reduce the parts to a semi-fluid state, in which the cerebral substance presents a dull whitish colour, without any appearance of sanguineous injection.

ACUTE HYDROCEPHALUS *(Essential).*

Q. What are its symptoms?

A. Headache, confined to the forehead or temples, increasing gradually, and occurring during the first septenary period of life, most usually during the process of dentition; frequent vomiting—slowness in movement, which is made with reluctance; restlessness, discomfort, irritability of the retina, with, in general, contraction, and immobility of the pupils; inclination to drowsiness, together with sudden startings, sleep incomplete while it lasts, sometimes gnashing the teeth. After some time, the headache is no longer complained of, or the child manifests it only by acute cries, or by carrying its hands as if instinctively towards its head. The drowsiness increases in degree, the patient lies on the back, sensibility gradually diminishes, the coma is interrupted by momentary convulsions, most usually manifested in the eyes, mouth, and upper extremities; sometimes there is a permanent strabismus, or a turning of the eye upwards; the pupils become dilated and immoveable, or, in some cases, agitated by constant oscillations; the pulse becomes slow and irregular; the bowels are in general constipated. It is about the

period that we begin to perceive remissions of the principal symptoms, which disappear more or less completely; during these intervals the patient recovers his understanding, and complains only of headache. If death does not occur during the comato-convulsive period, a state of collapse succeeds the latter, the pupils become more and more dilated, the extremities are in a state of general insensibility and relaxation, the pulse resumes its frequency, the skin becomes cold and covered with perspiration, the respiration is irregular, and death terminates this state which occasionally lasts for some days.

Q. What are the diseases with which it may be confounded?

A. They are arachnitis of the base of the middle lobes, "ramollissement," of the walls of the lateral ventricles, and worms in the intestinal canal.

Q. What are its Anatomical Characters?

A. The arachnoid membrane lining the lateral ventricles and base of the brain presents no alteration; on the convexity, it is rather dry; the superior convolutions of the hemispheres are depressed and flattened, and when touched, give a sense of fluctuation; the lateral ventricles, considerably dilated, and filled with a limpid straw-coloured fluid, without any flocculi; the dilatation is most manifest towards the digital cavity; the third and fourth ventricles contain but little fluid; the foramen of communication between the lateral ventricles is considerably enlarged.—Sometimes no fluid is found in the ventricles, though dilated, which arises from the fluid (being absorbed immediately) before death had occurred. The pia mater, enveloping the external surface of the brain, may be injected with blood, but this is not a very frequent occurrence, and should not in any case be considered as the cause of the effusion into the ventricles. Finally, when the disease has lasted for a considerable time, the digital cavity, the fornix, and corpus callosum may become softened, in the same way as has been described when treating of arachnitis of the ventricles.

CHRONIC HYDROCEPHALUS.

Q. What are its symptoms?

A. This disease is most usually constitutional, and then distinguishable by an excessive increase of the size of the head, separation of the sutures, transparence of the fontanelles, with fluctuation, perceptible by pressure. The activity of the senses and understanding is considerably diminished, or altogether lost; the movements are weak and feeble to the last degree; convulsions sometimes take place; the patient has not sufficient strength to support his head, it therefore droops constantly on the shoulders or chest. In some cases the head retains its natural dimensions, but we can then observe near the occiput a fluctuating tumour, surrounded by the investments of the brain, by pressing on which, we can make the fluid compress the brain, and cause comatose or convulsive symptoms. If the hydrocephalus occurs after the child has attained its first year, it can be distinguished by the gradual weakening of the sensitive and locomotive powers in proportion as the head increases in size; the headache becomes gradually less intense as the disease advances.

Q. What are the diseases with which it may be confounded?

A. When congenital it may be mistaken for encephalocele in adults; for some of the chronic alterations of the brain, or for hydatids, which sometimes give rise to it.

Q. What are its Anatomical Characters?

A. Separation of the sutures, incomplete ossification of the bones, in some of which the bony matter is altogether wanting; effusion of a citron-coloured serous fluid, in greater or less abundance. When the disease has lasted for some years, the fontanelles are occupied by a fibrous substance, and the bones become thin and considerably increased in breadth. If the effusion has taken place on the surface of the brain, then this organ, reduced to a very small size, is compressed towards the

base of the skull; if, on the contrary, the effusion occupies the lateral ventricles, then the hemispheres of the brain are expanded into a vast membranous pouch, the external surface of which is closely applied to the investing membranes.

HYDATIDS.

Q. What are its symptoms?

A. We have no means of distinguishing this affection from other tumours developed in the brain. Hydatids sometimes exist without giving rise to any particular disturbance of the system; at other times, however, they cause irregular headache, vertigo, fits, and convulsions, for which it is impossible to assign any adequate explanation until after death, which usually takes place suddenly.

Q. With what diseases may it be confounded?

A. With any of the chronic alterations of the brain or its membranes.

Q. What are its Anatomical Characters?

A. On examination we find some vesicular bodies belonging to the genera acephalocystis, polycephalus, and echinococcus: there may be but one of these, or there may be several. They usually occupy the lateral ventricles, and sometimes, though more rarely, the substance of the hemispheres; in this latter case they form for themselves a second covering at the expense of the substance of the brain, which increases in density, and assumes the appearance of a whitish membrane, somewhat similar to the membrane of an egg; its internal surface, which is in contact with the hydatid, is smooth, and may be easily detached from the brain. Hydatids vary in size from that of a pea to a large egg.

EFFUSION OF BLOOD.

(On the Surface of the Brain.)

Q. What are its symptoms?

A. Most usually after a severe contusion of the head, paralysis, with either a rigid or flaccid state of the muscles, occurs suddenly, either at one or both sides of the body; this is sometimes accompanied by spasmodic symptoms, but more frequently by a state of coma; but in cases in which the intellectual faculties are not altogether extinguished, the patient may complain of a severe headache or be somewhat delirious. As this disease so frequently induces inflammation of the arachnoid membrane and brain, it partakes of the characters of both, and naturally comes under the descriptions given of them.

Q. What are the diseases with which it may be confounded?

A. They are, simple concussion, congestion, or disorganization of a part of the brain.

Q. What are its Anatomical Characters?

A. Effusion of blood between the cranium and dura mater, into the cavity of the arachnoid membrane, or between the pia mater and brain, caused by the rupture of some vessels, or, though very rarely, by a mere exhalation of blood. In these different cases the blood is coagulated and diffused in a layer on the brain or between the convolutions; occasionally there is some in the lateral ventricles—in which case the meninges always exhibit a very considerable degree of congestion.

CONGESTION IN THE BRAIN.

Q. What are its symptoms?

A. A sense of weight in the head, vertigo, followed by a sudden deprivation of intellect; in other cases the articulation becomes embarrassed, the limbs completely relaxed at one or both sides of the body, and sometimes momentary spasmodic symptoms occur. These phenomena which are in general of very short duration, for the most part not more than a few hours, and seldom lasting beyond three or four days, terminate either in death or restoration to health.

Q. What are the diseases with which it may be confounded?

A. They are, haemorrhage into the substance of the brain, effusions into the ventricles, or encephalitis.

Q. What are its Anatomical Characters?

A. The substance of the brain and its investments are gorged with blood, which oozes out in minute drops on the surface of the incision when a section is made; its consistence, however, is by no means diminished.

APOPLEXY.

Q. What are its symptoms?

A. The predisposing circumstances to this complaint are, hereditary disposition, previous attacks, hypertrophy of the left ventricle of the heart, and the period of life from the 50th to the 70th year; in general, without any headache or other precursor, a paralysis, more or less complete, both of sensation and motion, suddenly occurs either in the whole of one side of the body, or only in one of its regions, accompanied by an immediate relaxation of the muscles of the parts affected. In cases of effusion into the brain, the paralysis is always protracted, the time of its duration being proportioned to the extent of the effusion; perception, though weakened, is preserved unless the coma be very profound; the respiration is more or less stertorous. At the commencement the pulse is hard and full, but we observe no fever, no headache, during the course of the disease; no vomiting occurring at its invasion, on the contrary it is difficult to excite it; there is in general constipation or retention of urine. When the paralysis attacks the muscles of the face, as is generally the case, the point of the tongue when protruded inclines to the paralytic side*,

* When a paralysis, whatever be its cause, affects one side of the head, the lips are drawn towards the sound side, by the zigomatic muscles, in consequence of the paralysis of their antagonists; and the point of the

the commissure of the lips at the sound side is drawn upwards and outwards, when the patient moves it, whilst on the other it is depressed and pendant, or merely immoveable; the muscles of the cheek on the paralysed side, and those of the eyelid are sometimes, though not very commonly, in a state of relaxation more or less complete; the pupil is insensible, sometimes dilated; lastly, the head is drawn to the sound side by the muscles, which remain unaffected by the paralysis. It seldom attacks both sides of the body at the same time: but if it should, then the patient is found in a state of total insensibility or complete carus. It sometimes happens that after the first attack, a second takes place at the sound sides, so suddenly as to induce a belief in the existence of a double paralysis occurring at the same moment; the history of the case alone can rectify the error. Apoplexy may be confounded with "ramollissement" of the brain, or with effusion of blood on its surface.

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tongue, as it issues from the mouth, deviates towards the paralysed side, which seems at first rather singular, but is at once explained by considering the muscular power that protrudes the tongue out of the mouth. This is effected by the posterior portion of the genio-glossus muscle, the fixed point of which is at the chin, the moveable one at the base of the tongue. When this part of the muscle acts, its two extremities approach, and so the base of the tongue is drawn forwards, towards the fixed attachment of the muscle. If then this insertion be to the right of the median line, the base of the tongue is brought forward and to the right, and its point by consequence forward and to the left. But when the patient draws back the point of the tongue, it always inclines or deviates towards the sound side. It is by a similar mechanism that the face is inclined towards the paralysed side, which is caused by the contraction of the sterno-mastoid muscle of the sound side.

Q. What are the diseases with which it may be confounded?

A. They are, encephalitis, "ramollissement" of the brain, or effusion of blood on its surface.

Q. What are its Anatomical Characters?

A. Effusion of blood to a greater or less extent in the hemisphere of the brain, opposite to the side in which the paralysis has occurred. The fluid is found either in several small cavities, or accumulated into one mass. At other times it is intimately blended with the cerebral substance, and forms with it a red or brown pulpy mass. When the effusion is recent, having existed but for a few days, the blood is black and partly coagulated, it seems adherent to the cerebral substance, but may be removed from it by effusion with water. The part of the brain surrounding the clot is torn and irregular, its consistence much diminished, its colour a deep red, which becomes gradually less so, as we examine it farther from the centre of the effused mass—this alteration, however, extends no farther in general than a few lines. In some cases we find a few shreds of the substance of the brain, which being softened and tinged with blood, resembled very closely coagula of blood.

At a more advanced period, the part of the brain surrounding the clot, after having been softened in the first instance, resumes its firmness, and presents a yellowish colour, a serous effusion is poured round the clot, which gradually diminishes in size, and loses its original colour, for having been black, it by degrees becomes red, then yellow and grey, and finally is absorbed altogether, when the walls of the cavity approach each other, contract adhesions, and after some time present a real cicatrix of a linear form, and somewhat yellow colour, which is produced by means of cellular and vascular bands. In other cases, the walls of the cavity approach and remain contiguous, without contracting adhesions to each other; and finally, we sometimes find that the walls become covered with a false membrane, which is very thin, gradually increases in consistence, and changes into a cyst, which contains some serous fluid,

at first of a deep red, then of a paler tinge and lastly yellow, and encloses a clot which also passes through the different changes we have just indicated.

When this is completely absorbed, the walls of the cyst may become united in the same way as occurs in simple cavities. We sometimes find either in the hemispheres in which the recent effusion has occurred, or in the other several cavities resulting from old apoplectic attacks.

The portions of the brain, most usually the seat of these effusions, are the corpora striata, the optic thalami, and the parts immediately surrounding them, corresponding ventricle, or even into the opposite one after having torn through the septum lucidum. In cases of haemorrhagy of the substance of the brain, the parts that remain unaffected present, when divided by an incision, an infinite number of minute drops of blood, which re-appear again after being wiped away. The vessels of the pia mater, and also the sinuses of the dura mater, are constantly gorged with blood.

ENCEPHALITIS.

Q. What are its symptoms?

A. Inflammation of the brain may occur at any period of life from infancy to old age. There are usually some premonitory symptoms, such as a sense of weight in the head, of tinglings in the ears, deception of vision, irritability of the retina, numbness of one side of the body, pain or prickling of the limbs; when suddenly there supervenes a state of contraction or convulsion, continued or intermittent, of the muscles of one side of the body, or only of one of its regions. If the intellectual faculties be not altogether destroyed, the patient complains of headache usually referred to the side opposite to that which is the seat of the contraction; there is no delirium, the understanding is not deranged, it is merely weakened. Sometimes the contracted limbs are painful, particularly when they are flexed, and an effort is made to extend them; the pu-

pil of the affected side is in some instances contracted, and the eye closed by the contraction of the orbicularis muscle; the commissure of the lips is drawn outwards even when the mouth is not moved; but when any voluntary motions are made, the commissure of the opposite side experiences a deviation; the muscles of the neck are in a state of rigidity, and draw the head towards the affected side. Still these various effects of irritation diminish gradually in intensity, and are succeeded by symptoms of collapse; the muscles fall into a state of paralysis with flaccidity; the eye remains closed, but it is by relaxation; the commissure of the lips hitherto contracted becomes pendent; the head and mouth are drawn in the direction *opposite* to that to which they had previously inclined; that is to say, to the sound side; the pupil is dilated, the sensibility of the affected side totally lost, and the understanding completely destroyed. We may here remark, that in order to trace these different effects of the disease, we must observe the patient from the first invasion of the attack to its final termination.

In some cases, we find that a rigid state of the muscles supervenes after a sudden paralysis with flaccidity; this is caused by the apoplexy being followed by encephalitis; the walls of the cavity, in which the effusion had taken place, being then seized with inflammation.

If convulsions attack the side that remained unaffected, and if they be not followed by paralysis, they are caused by the occurrence of inflammation of the arachnoid membrane. If however a paralysis succeeds, it arises from a new inflammation attacking the opposite side.

And finally, when encephalitis succeeds to arachnitis, particularly that of the base of the brain, as occurs usually in children, one of the sides affected by convulsions becomes paralyzed.

Encephalitis presents several groups of symptoms, each indicating a lesion of a particular part of the brain. Affections of the upper extremity seem referrible to lesions of the posterior fibres of the optic thalamus of

the opposite side; those of the lower extremity to alterations of the anterior half of the corpus striatum.

Paralysis of both sides of the body at the same time depends on an alteration of the central part of the pons Varolii.

When there is no paralysis or muscular rigidity at either side of the body, and when a comatose state occurs, and goes on progressively increasing, we may suspect inflammation of the corpus callosum, septum lucidum, or fornix.

Loss of the power of utterance seems to depend on an alteration of the anterior lobules of the hemispheres.

Strabismus, rotation of the eye, dilatation, contraction, immobility, constant oscillation of the pupil at one side, indicate usually an alteration of the surface of the corpora quadrigemina of the opposite side.

Lesions of the pituitary gland, of the infundibulum, and of the grey lamella in which it terminates, by causing compression of the optic nerve at one side behind the point of decussation, may induce blindness of the opposite eye.

As to alterations of the transparency of the membranes and humours of the eye, and to paralysis of the organs of sense at one side, they seem to depend either on a derangement of the ganglion of the fifth pair of nerves where it lies, on the petrous portion of the temporal bone, or a lesion of the corresponding walls of the fourth ventricle.

Finally, derangements of the circulation, respiration, and of the generative system, without paralysis of the limbs, indicate an alteration of one of the lobes of the cerebellum.

Q. What are the diseases with which it may be confounded?

A. They are haemorrhage, or "remollissement" of the substance of the brain, nervous fever, some cases of arachnitis, especially when it is circumscribed, and local effusions.

Q. What are its Anatomical Characters?

A. The inflamed part of the brain presents different

appearances, according to the time that the disease has lasted. When it is only of some days' duration, the white substance, and still more perceptibly the grey, exhibits a rosy or slightly red colour, and in it we perceive several vascular filaments. The firmness of the affected part is considerably diminished, and when cut into, the surface of the incision presents (not a multitude of minute drops of blood reappearing after being wiped away, as occurs in congestion, but) a multitude of small red points, which cannot be moved by ablution. We frequently have occasion to observe these appearances in the cortical substance of the convolutions after arachnitis or violent congestions of the pia mater. In a more advanced stage of encephalitis the brain is red, the vascular injection more strongly marked, and the "ramollissement" very considerable. Finally, in some cases the blood becomes so intimately combined with the cerebral substance, that its colour approaches that of the lees of wine, being of a deep, dusky red; there is no actual effusion of blood, except we consider as such some small dots about the size of a pin's head, which we occasionally find in some particular points: in such cases the brain is in a state of extreme "ramollissement," or softening.

If it should happen that the inflammation proceeds to these two latter stages without causing death, then the part affected begins gradually to lose its softness, and ultimately becomes more dense than in the natural state; it retains for some time its red colour, but changes finally to a dusky yellow.

The third stage of encephalitis is that of suppuration; the red colour gradually disappears, the blood is replaced by a sero-purulent fluid, which is infiltered into the substance of the brain, combines with it, and gives to it, according to the extent of the admixture, a greyish dull white, or yellowish green colour. The pus accumulates in some spots to a greater or less extent; sometimes there are no more than one or two drops, but still they are easily recognized by their resemblance to the pus of ordinary phlegmonia; in other cases, however, it occu-

pies the entire of the centre of one hemisphere where, extravasated as it were, it forms cavities for itself, in which we find mixed with it several fragments of cerebral substance; lastly, in some cases, we find several small cavities uniting together to form a large one.

These cavities are sometimes found separated from the substance of the brain by a new membrane, formed of the remains of the cellular tissue and vessels, which had escaped the effects of the suppuration, and which, when compressed towards the circumference of the cavity, interlace mutually, become organized, gradually increase, and become changed into a membrane whose thickness and density are progressively augmented. The internal surface of these cysts becomes smooth; the pus which they contain assumes more and more the characters of pus formed in cellular tissue, by reason of the progressive destruction of the cerebral substance, and finally becomes white, yellowish or greenish, and perfectly homogeneous. Sometimes when the abscess is seated near the convolutions, the pia mater and arachnoid becoming thickened, concur in the formation of its walls. The pus of abscesses in the brain rarely emits any odour, except such as occurs in consequence of caries of the bones of the head, particularly of the petrous portion of the temporal bone; in which cases it is always fetid, and the membranes are altered and perforated.

The grey substance is the most usual seat of encephalitis; and the parts most commonly affected are the corpora striata, optic thalami, the convolutions, pons Varolii, and cerebellum.

RAMOLLISSEMENT, OR SOFTENING OF THE BRAIN.

Q. What are the symptoms of this affection?

A. They are nearly the same as those of encephalitis, only that its precursors are more common, hence we shall merely add to what has been already stated under the latter head, that if in any case the intellects remain undisturbed, and the headache continues for a long

time; if sensibility and muscular power diminish gradually, and somnolence becomes the leading character; and, finally, if there be neither paralysis, rigidity of the muscles, nor convulsion, the patient being in a state merely comatose, with strabismus and dilated pupils, we may suspect a "ramollissement" of the corpus callosum, septum lucidum, or fornix. Such a case is very likely to be confounded with arachnitis of the base of the brain in adults, or with the same affection in children if there be convulsions.

NOTE.

By "ramollissement" of the brain is understood a softening or degenerescence of part of its substance, the rest preserving nearly its ordinary consistence. This expression possesses the peculiar advantage of giving an exact idea of the state of the parts, without involving any opinion on the nature or cause of the disease. On this subject opinions have been very much divided. In the text the reader will find an outline of the peculiar views of Professor Ricamier, who still contends that "ramollissement" is a disease *sui generis*—a peculiar degeneration, which may be compared to certain alterations of the spleen. He denies that these changes are produced by inflammation, and considers them as the effects of a general cause—a disease of the whole system; in fact, an ataxic, nervous or malignant fever, which attacks the nervous system, and more particularly the brain, destroying and disorganizing its structure, and so producing "ramollissement," degenerescence, putrid abscess, &c. In direct opposition to this doctrine, Lallemand and Abercrombie contend, that this affection is altogether inflammatory in its character, and refer the symptoms exhibited during life, as well as the appearances presented after death, to inflammation of the substance of the brain. Acute inflammation produces the same effects in the brain that it does in other organs, namely, diminution of its consistence or "ramollissement," and change of colour, the various shades of the latter being dependent on the degree and proportion in which

blood in the first stage, and pus in the second, happen to be infiltrated into its tissue. In the former, we observe degrees of tinge varying from a greyish red to a dark dusky hue, not unlike that of the lees of wine; and in the latter, when suppuration sets in, and pus begins to take the place of blood, the colour changes again, and varies from a dirty white to a green.

The symptoms of inflammation of the brain present two characters altogether opposite, those of irritation and those of collapse. The former is marked by headache, sensibility of the retina, contraction of the pupil, pain of the limbs, and continued or intermittent contraction of the muscles; the latter by diminution of the intelligence, somnolence, deafness, loss of vision and power of utterance, with paralysis of the muscles, and insensibility of the skin. The first series, it is true, occurs in arachnitis and the second in apoplexy; but it is only in inflammation of the brain that the two are united; for in it we find irritation followed by disorganization. Hence we may briefly sum up the distinctive symptoms of these three affections. In inflammations of the arachnoid membrane we find *spasmodic symptoms without paralysis;* in haemorrhage, *sudden paralysis, without spasmodic symptoms;* in inflammation of the brain, *spasmodic symptoms, slow and progressive paralysis, the progress of which is unequal and intermittent.*"

Q. What are the diseases with which it may be confounded?

A. They are, encephalitis, nervous fever, arachnitis of the base of the brain in adults, and, if convulsions occur, with the same affection in children.

Q. What are its Anatomical Characters?

A. They are softness to a greater or less degree of the substance of the brain, without any trace of vascular injection or perceptible change of colour, the medullary portion being of a dull white, and homogeneous, whilst the grey substance remains in its natural state, whatever be the degree of softening, or, "ramollissement;" even when the part affected becomes perfectly diffluent, it is

impossible to discover the least trace of real pus, nor do the sections of the brain exhibit any drops of blood oozing from this surface. If it is the convolutions that are affected, the corresponding part of the pia mater presents no appearance of injection. This sort of disorganization is never accompanied by any peculiar odour. "Ramollissement," if we except the mere circumstance of its being confined to parts of greater or less extent, exhibits in every respect the same physical characters, as a brain which begins to be decomposed after having been kept for some days. The parts most commonly affected are not those which in the natural state are the least firm; for we find that the walls of the ventricles, the corpora striata, and optic thalami, suffer this disorganization more frequently than the cerebellum.

TUBERCLES AND CANCER OF THE BRAIN.

Q. What are its symptoms?

A. The only symptoms which can induce us to suspect the existence of tubercle, scirrhus, or cancer of the brain, are violent headaches, continued or intermittent, with spasms of one or both sides of the body, and total suspension of the faculties; to these in some instances are added a consecutive paralysis; with diminution or abolition of the senses and intellects. These different tumours in general give rise to encephalitis, which then presents the train of symptoms already detailed when treating of that disease. In children, tubercles are very common, and induce acute dropsy of the ventricles of the comato-convulsive form, as we have already stated. Occasionally, however, these tumours do not give rise to any appreciable derangement.

Q. What are the diseases with which they may be confounded?

A. They are arachnitis of the ventricles and base of the brain, encephalitis, fungus of the dura mater, or hydatids in the brain.

Q. What are its Anatomical Characters?

A. The accidental tissues most usually in the brain

are scirrhus, tubercle, and encephaloid. They are found in the form of round irregular masses, varying from the size of a pea to that of an egg, of a greyish or reddish colour, and sometimes nodulated on the external surface. The tumour sometimes consists but of one of these structures, but we occasionally find several combined together; the nature of the degenerescence can be determined only by cutting into it; the interior is sometimes found softened, and contains some effused blood. The adjacent portion of the brain is, in general, in a state of "ramollissement" to a greater or less extent; at other times the accidental production is lost gradually in the cerebral substance, without presenting any line of demarcation. When the tumour extends to the convolutions, it generally gives rise to a chronic inflammation of the pia mater and arachnoid membrane.

EPILEPSY.

Q. What are its symptoms?

A. This affection is intermittent, chronic, without fever, comes on by fits with general convulsions, complete loss of intelligence, total insensibility, but still without any consecutive paralysis either of mobility or sensibility. At a moment when he least expects it, the patient suddenly becomes senseless, the eyes are opened widely, the pupils remain immoveable, the direction of the eyes becomes changed, the face is drawn to one side, the mouth dragged towards the ear, and the teeth firmly closed; then after some minutes the muscles of the neck become rigid, the head is turned to one side, the jugular veins become distended, and the face is in a state of livid turgescence; the muscles of the countenance are then seized with spasmodic contractions frequently repeated; foam issues from the mouth, the extremities, particularly the upper, are agitated by convulsive motions; the thumbs are buried, as it were, into the palms of the hands; still the thorax remains fixed and immoveable; the respiration is high and agitated; suffocation

imminent. To this state, which lasts from two to eight minutes, and may be repeated at very short intervals, succeeds a general relaxation of the muscular system, paleness of the face, and a gradual return to freedom of respiration; the countenance for some time retains an expression of stupidity; the intellectual and sensitive faculties, which had been plunged in stupefaction, gradually resume their activity, and the patient begins to perceive a creeping sensation all over his body. At other times the attack is much less violent, and consists only of a momentary loss of sense, with slight and partial convulsions of the eyes, mouth, of an arm or a finger; and may or may not be accompanied by a fall. Sometimes the attack is preceded by a peculiar sensation in some part of the body, which directs itself towards the brain, and thence causes the loss of sense, and the various other phenomena mentioned above; this is what has been termed the *aura epileptica*. Epilepsy may occur at any period of life; it generally goes on increasing, as the fits occur at shorter intervals; it induces a loss of memory, and tends essentially to produce madness and idiocy.

Q. What are the diseases with which it may be confounded?

A. They are hysteria, worms in the intestinal canal, the first stage of acute hydrocephalus, encephalitis, with different tumours of the brain and its investments.

Q. What are its anatomical characters?

A. We know of none that are peculiar to epilepsy; still several alterations of the brain and spinal marrow may give rise to epileptic symptoms, as the history of these affections demonstrates.

HYSTERIA.

Q. What are its symptoms?

A. This is an intermittent, irregular, chronic disease, that comes on by fits, and usually attacks females from the age of puberty to the critical period; it very

commonly occurs on the suppression or diminution of the menses, particularly in persons of a nervous or irritable temperament, who have indulged much in venereal pleasures; or have been for a long time deprived of them. The fit begins with a yawning, numbness of the extremities, involuntary laughing and crying, alternations of pallor and redness of the face, and a sensation as if a ball, commencing at the hypogastrium, ascended through the abdomen and thorax to settle at the throat, where it produces a sense of violent constriction, with threatening of suffocation. Then spasmodic motions of different parts of the body occur, or there is a tetanic stiffness of them, with loss more or less complete of sensation, but without any consecutive paralysis. Hysteric fits do not in general come on instantaneously, and without cause, as is the case in epilepsy; chagrin, pain, mental emotions usually give rise to them. Hysteria does not tend essentially to increase, nor does it determine, as a consequence, madness or idiocy.

Q. What are the diseases with which it may be confounded?

A. They are epilepsy, certain diseases of the uterus, and intestinal worms.

Q. What are its anatomical characters?

A. They are altogether unknown.

CATALEPSY.

Q. What are its symptoms?

A. Suspension of sensation and motion occurring suddenly, whether the patient be sitting, standing, or lying, and accompanied with such a complete immobility of the different parts of the body, that they retain indifferently the position which they had before the attack, or any that may be given to them during its continuance. The circulation and respiration are not at all disturbed; in some instances, however, they become more slow. These attacks, which occur at intervals more or less irregular, last usually from some minutes to several hours, or even

for the length of a day. This disease, which is very rare, is sometimes simulated; it should rather be considered as symptomatic than as an essential affection. Pathological anatomy has not as yet been able to assign any form of alteration peculiar to this complaint.

CHOREA.

Q. What are its symptoms?

A. A certain number of, or in some cases, all the voluntary muscles, are subject to irregular and continued movements, producing remarkable grimaces and contortions. The disease is sometimes confined to one side of the body, or is more perceptible at one side than at the other. The muscles, in addition to this incoherence in their motions, are affected with a sensation of pricking, creeping, or of numbness. Chorea attacks children much more frequently than adults, and females more usually than males.

Q. What are the diseases with which it may be confounded?

A. They are chronic encephalitis, certain affections of the medulla spinalis, or with tubercles on the brain.

Q. What are its anatomical characters?

A. They are altogether unknown.

HYPOCHONDRIASIS.

Q. What are its symptoms?

A. This affection is chronic in its character, and very irregular in its course; it sometimes is intermittent, in general attacks adults, particularly men; it, in many cases, is consecutive on gastro-enteritis, if the persons attacked by it are of a nervous temperament, and if their hepatic system be considerably developed, or if their moral and physical habits tend to derange the digestive functions, at the same time that they exalt and cultivate the intellectual.

The principal effects of hypochondriasis are referrible to disturbance of the intelligence; of digestion,

and functions of the liver; these are, gloominess, irascibility, distrust even of intimate friends, constant restlessness, timidity, and fear of death; sleep becomes short and agitated; sometimes there is headache, and even vertigo; the digestion is slow and painful, accompanied by distention and swelling of the stomach and intestinal canal, flatulence, colic, and constipation in most cases; in some cases, however, we find diarrhœa; the pulse is sometimes frequent, contracted, intermittent; at others slow and irregular; the patient heightens the extent of his sufferings, and describes them in exaggerated terms. He experiences various sensations, in general momentatary; such as cramps, tremblings, palpitations, faintings, and irregular pulsations in the abdomen. The respiration is sometimes difficult, and as it were constricted. This affection frequently terminates in monomania.

Q. What are the diseases with which it may be confounded?

A. They are chronic gastro-enteritis and mania.

Q. What are its anatomical characters?

A. We usually find some alterations of the brain, or of the abdominal viscera; but it is very difficult to decide whether they are the sole causes of the disease.

MANIA.

Q. What are its symptoms?

A. Derangement, more or less marked, but of long continuance, of one or more of the faculties of the mind, without any perceptible disturbance of the sensations or voluntary motions. There is no fever, except during the period of excitement, which usually manifests itself by headache, want of sleep, delirium, and various hallucinations. When some particular idea constantly haunts the patient, the disease is termed *monomania*. The organic functions are seldom disturbed, except the nutrition, which is not properly performed; hence many maniacs lose

flesh and become thin. This affection may be confounded at its commencement with arachnitis, drunkenness, or with the effects of certain poisons.

Q. With what diseases may it be confounded?

A. It may be confounded, in an early stage, with arachnitis, the effects of certain poisons, or with drunkenness.

Q. What are its anatomical characters?

A. Mania may be connected with alterations of the brain or its investments, but several cases occur in which it cannot be traced to any such cause. In some it is connected with chronic inflammation of the intestinal canal.

AMENTIA.

Q. What are its symptoms?

A. Diminution, more or less considerable, of the powers of the mind, with weakness or loss of memory, total indifference and incoherence of ideas and actions, which have no determined object. This affection most commonly occurs in persons advanced in years; it is not accompanied by fever, or any disturbance of the organic functions; and as in most instances it arises in persons who had previously been of sound mind, it must in such at least be regarded as consecutive upon some affection of the substance of the brain.

Q. With what diseases may it be confounded?

A. With chronic arachnitis, and with some morbid alterations of the brain.

Q. What are its anatomical characters?

A. These are referrible to various alterations of the brain when the affection is symptomatic; sometimes we find atrophy of the brain depending on old age.

IDIOTISM.

Q. What are its symptoms?

A. The faculties of the mind are incompletely or not at all developed, in consequence of a defective or-

ganization of the brain—a condition which may commence at the first moments of existence, or be produced at any subsequent period before the full evolution of the understanding. In these persons the general sensibility is but little developed, the senses are generally dull, and the power of articulation so defective, that in many cases they may be said rather to howl or cry ; the limbs are wasted, paralysed, or ill-formed ; the temperament is generally lymphatic, sometimes scrofulous. There is no perceptible alteration of the digestion, circulation, or respiration.

Q. Describe the character of the cretins?

A. These constitute a variety of idiots, presenting the following physical characters : head rather large, forehead and occiput usually flattened, visage square, and marked with wrinkles: nose thick, short, and broad, mouth very wide, ears thick and elongated ; "goitres" more or less voluminous and pendant towards the chest ; thorax narrow and flat, genital organs much developed, height seldom more than four feet.

Q. What are its anatomical characters?

A. The heads of idiots usually present a deficient conformation; their size is most commonly small, the forehead is flat, short, and sloping backwards, the occiput is depressed ; there is sometimes a perceptible difference in the development of the two sides of the skull. The brain presents also a corresponding deficiency of organization.

PHYSIOLOGY OF THE NERVES.

Q. What is understood by a nerve?

A. It is a cord composed of cerebral substance covered by membranes, similar to those which surround the brain ; thus its outer membrane is tough and fibrous in structure ; its second coat is much thinner ; and its third is vascular, and similar to the Pia Mater. Besides these coats, a membrane, called *neurilema*, divides its component filaments.

Q. Are nerves dependent on the brain for sensation and motion?

A. Yes; those which arise from it are, but they possess peculiar powers themselves, when they communicate with each other in plexuses or in ganglions, of giving an increase of substance and power to others proceeding from them; and when they arise from the spinal marrow, they are more independent of the brain.

Q. What is the action of the nerves in producing sensation?

A. It has been differently explained; by some, it has been considered as the result of irritation, by others of a circulating fluid, by others of electricity; but as, in science, the phenomena are all we know, these terms only cover, but do not remove the difficulty. The phenomena of the nerves are known by the senses, and the information they give us is all we know about them.

Q. How is it proved that the nerves are actually the organs of feeling?

A. Because when they are destroyed, the parts to which they are distributed lose their feeling: thus, if the optic nerve be destroyed, the person becomes blind; if the acoustic nerve be divided, he loses his hearing. The wounds of nerves produce horrible pains; every disease which alters the qualities of the nerves, alters those of the parts to which it goes.

Q. What are the general properties of sensations?

A. They can be increased by exposing the sense to the greatest possible surface, by receiving one impression only at once, and giving to them our whole attention; they can be diminished, as the sight, by contracting the brows, and drawing together the eyelids; habit also lessens their intensity; the loss of one sense increases the power of the others; they have a reciprocal influence on each other; thus the sense of smell is the guide and sentinel of taste; taste in its turn exercises a powerful influence upon smell; the same substance is not equally agreeable to the senses of taste and smell, &c.

Q. How are sensations divided?

A. Into those which are agreeable and those which are disagreeable, or into pleasure and pain.

Q. What is meant by internal sensations?

A. The sensations which almost all the organs on being touched give to the brain; the bones, ligaments, aponeuroses, &c. have not this faculty, as they are insensible to the most acrid stimuli, to fire, &c. There are besides these sensations others which arise without any external stimuli, as, those of hunger, thirst, the desire to make water, to go to stool, to respire, and the venereal appetite. These are sometimes very active and pressing, as before they are satisfied; afterwards, there follows a sensation of fatigue, with a diminution of activity in the organs which give rise to them. Another class of sensations arise in disease; it belongs to the physician to study these deeply.

Q. What is the difference between the ideas which are received from external and internal impressions?

A. Those from the external furnish all our knowledge, and are distinct and clear; those from internal sources, are vague and confused, and give us no lasting impressions; they are agreeable or the contrary, according as the organs which furnish them are in a proper state.

Q. What circumstances modify our internal sensations?

A. Age, sex, temperament, seasons, climate, custom, and individual disposition, &c.

Q. How many pairs of nerves arise within the cranium?

A. *Nine pairs,* together with the glosso-pharyngeus and accessorius, on each side.

Q. Describe the *first pair* of nerves, called the Olfactory?

A. The *Olfactory nerves* arise by several striae from the corpora striata, run forward in a groove to the cribriform plate of the ethmoid bone, where each forms a bulb, from which various filaments are sent off, and

pass through the cribriform plate, to be distributed upon the mucous membrane of the nostrils.

Q. Describe the origin and course of the *second pair*, or Optic nerves?

A. The *Optic nerves* arise from the posterior part of the thalami optici, and partly from the tubercula quadrigemina: they converge and unite at the fore part of the sella Turcica; they afterwards separate, diverge, and each passes out of the cranium by the foramen opticum, into the orbit, in a winding manner, perforates the coats of the ball, and is expanded into the retina.

Q. Why does the optic nerve take a waving course in the orbit?

A. To prevent it from being overstretched in the different motions of the eye.

Q. Describe the *third pair* of nerves, called Motores oculorum?

A. The *Motores Oculorum* arise from the under, inner, and back part of the crura cerebri, by numerous threads collected into their trunks; they perforate the dura mater at the sides of the posterior clinoid process, run along the upper part of the cavernous sinuses at the outside of the carotid arteries, and pass through the foramina lacera anteriora into the orbits, to be distributed upon all the muscles, excepting the trochlearis and abductor. It also reflects a small branch to assist in forming the ophthalmic ganglion.

Q. Describe the origin and course of the *fourth pair* of nerves, the Trochleares or Pathetici.

A. The *trochleares* are very slender, and arise from the Valvula cerebri behind the testes; each goes out between the cerebrum and cerebellum, by the side of the pons Varolii, passes through the cavernous sinus, and out by the foramen lacerum anterius, and is entirely dispersed upon the trochlear, or superior oblique muscle.

Q. Describe the origin and distribution of the *fifth pair* of nerves, or Par Trigeminum.

A. The Trigemini are large, and arise by an ante-

rior and a posterior portion from the side of the Tuber annulare, where the crura cerebelli join it: each perforates the Dura Mater, enters the cavernous sinus, forms a plexus, which terminates in the GASSERIAN ganglion, out of which three branches are sent, namely, the ophthalmic, superior maxillary, and inferior maxillary.

Q. Describe the *Ophthalmic branch* of the fifth pair?

A. The Ophthalmic nerve at the side of the Sella Turcica, is connected by nervous substance with the trunk of the fourth pair, then rises a little, crosses over the third pair, goes out by the foramen lacerum into the orbit, and sends off three principal branches, the lachrymal, nasal, and supra-trochlear; while the trunk passes through the supra-orbitary hole or notch, ascends the forehead, and receives the name of frontal nerve.

Q. Does the Ophthalmic assist in the formation of the *ophthalmic* or *lenticular ganglion?*

A. Yes; a small filament is sent off from the nasal branch, or from the trunk itself, to join the branch of the third pair, in the formation of the ganglion.

Q. Is any other nerve reflected from the Ophthalmic?

A. Yes; the *nasal* branch very generally sends a *filament* through the foramen orbitarium internum anterius, which re-enters the cranium, rises upon the cribriform plate, passes out with the Olfactory nerve, and is dispersed upon the anterior part of the nostril.

Q. Describe the *Superior Maxillary Nerve?*

A. This second branch of the fifth pair passes through the foramen rotundum of the sphenoid bone, and then sends off two principal branches, viz. the spheno-palatine, or lateral nasal nerve, and the palato-maxillary, or palatine; while the trunk itself afterwards enters the canal under the orbit, and, issuing, forms the infra-orbitar nerve.

Q. What particular branches does the Spheno-palatine nerve send off?

A. *Two;* one of which, the Pterygoid, is reflected

and sent through the foramen pterygoideum of the sphenoid bone, to communicate with the great sympathetic in the carotic canal: the other branch of which, the Vidian, enters the foramen innominatum of the petrous portion of the temporal bone, to communicate with the portio dura of the seventh pair in the aqueduct of FALLOPIUS.

Q. What is the distribution of the infra-orbitar nerve?

A. While in the canal under the orbit, it sends off several small filaments to the bones, to the antrum maxillare, and to the teeth; it passes out by the foramen infra-orbitarium, and is divided into branches, which are dispersed upon the cheek, nose, and palpebrae.

Q. Describe the third branch of the fifth pair, or *Inferior Maxillary Nerve?*

A. It passes out of the cranium by the foramen ovale, sends off some small twigs to the contiguous muscles, and one of considerable size, named the *Lingual*, or *Gustatory nerve;* directing its course between the pterygoid muscles, it enters the foramen maxillare posterius; and when running along the canal, it gives off nerves to the teeth and substance of the jaw, and at last emerges by the foramen menti, to be dispersed upon the chin and under lip.

Q. What is the distribution of the Lingual or Gustatory branch?

A. It runs forward between the pterygoid muscles, gives off some filaments to them, to the submaxillary and sublingual glands, and ultimately terminates near the apex of the tongue, being chiefly dispersed upon its papillae.

Q. Describe the origin, course, and distribution of the *sixth pair* of nerves, named *Abducentes?*

A. It arises between the tuber annulare and corpora pyramidalia, from the beginning of the medulla oblongata, is very small, runs forwards through the cavernous sinus between the ophthalmic nerve and carotid artery; on the surface of this artery it sends

down two or three filaments, which constitute the origin of the great sympathetic nerve; it afterwards passes out of the cranium by the foramen lacerum superius, and is entirely dispersed upon the abductor muscle.

Q. Describe the origin of the *seventh pair of nerves?*

A. The seventh pair is composed of two portions, a portio mollis, and a portio dura; the *portio mollis*, or proper *auditory nerve*, arises by transverse medullary striae from the anterior part of the fourth ventricle, and partly from the tuber annulare; the *portio dura*, called also sympatheticus minor, or the facial nerve, arises from that part common to the pons Varolii, crus cerebelli, and medulla oblongata; is situated on the mesial side of the portio mollis; the two portions are afterwards applied to each other; the portio mollis having a groove on its surface, receives the portio dura.

Q. Describe the *course* and *distribution* of the *seventh pair?*

A. This pair directs its course to the foramen auditorium internum, which it enters, and at the bottom of the foramen, the *portio dura* separates, and enters the aqueduct of Fallopius by the superior and anterior foramen, passes along the canal of the aqueduct, and comes out by the foramen stylo-mastoideum to be distributed upon the face and side of the head: The *portio mollis*, being much larger than the former, is divided into two fasciculi of nearly equal size; one of which by a number of fibrillae passes through the cribriform plate, in the bottom of the meatus, and is dispersed on the parts of the cochlea; the other fasciculus passing through the cribriform plate, in a similar manner, by fibrillae, is dispersed upon the vestible, and three semicircular canals.

Q. What nerves does the portio dura receive and give off, while it is passing through the aqueduct of Fallopius?

A. It first receives the Vidian nerve, being a *branch reflected* from the superior maxillary, and then, after passing a short space, gives off the *Chorda Tym-*

pani ; in its passage, it sends also twigs to the mastoid cells, and stapedius.

Q. Describe the course and termination of the *Chorda Tympani ?*

A. The chorda tympani crosses the tympanum between the handle of the malleus, and inferior crus of the incus, along the membrana tympani, and, after running along the outside of the Eustachian tube, it terminates in the lingual branch of the fifth pair; in its passage, it gives twigs to the muscles and membranes of the tympanum.

Q. Describe the origin and exit from the cranium, of the *eighth pair* of nerves, called *Pars Vaga ?*

A. The pars vaga, or eighth pair, arises from the medulla oblongata at the side of the base of the corpus olivare, together with the Glosso-pharyngeus, which, by some anatomists, is considered a part of the eighth pair; the nervus Accessorius ad par octavum, arises a little farther down from the termination of the medulla oblongata, and beginning of the medulla spinalis ; hence, these three nerves arise from the side of the medulla in this order, the glosso-pharyngeus above, the pars vaga in the middle, and the accessorius the lowest. They all pass out of the cranium by the foramen lacerum posterius, but are separated from each other, and from the lateral sinus behind, by small processes of the dura mater.

Q. What course does the *Pars Vaga* take, and what branches does it send off shortly after its egress from the cranium ?

A. It frequently becomes enlarged for nearly an inch after its egress; it descends at the outer and back part of the common carotid artery, and is included with it in the same sheath of cellular substance. At the upper part of the neck it sends off the pharyngeus ; and soon afterwards the laryngeus superior; near the top of the thorax it sends a filament or two to join the cardiac nerves, and afterwards enters the thorax.

Q. Describe the principal communications and ter-

mination of the *glosso-pharyngeus*, or *Lingualis lateralis* as it is sometimes called?

A. Immediately after its exit from the cranium, it sends a branch backwards to join the digastric branch of the portio dura: a little lower, it sends small twigs to communicate with others from the pharyngeus, and from the great sympathetic, to form a plexus, which embraces the internal carotid artery, and sends branches down to the heart: still lower down, it sends filaments, which communicate with others from the pharyngeus, to be distributed upon the pharynx and stylo-pharyngeus muscle; it then gives twigs to the tonsil, pharynx, and membrane of the epiglottis, and is dispersed upon the root of the tongue.

Q. Describe the communications and termination of the *Accessorius ad par octavum*?

A. It first sends a branch to the pharyngeus, another smaller to the pars vaga, and at the fore part of the sterno-cleido-mastoideus, it joins the sub-occipital by an arch, and frequently the first cervical by another; it then passes through this muscle, gives branches to its substance, and terminates in the trapezius.

Q. Describe the origin and egress from the cranium of the *ninth pair* of nerves, viz. the *Lingualis*, and its communications?

A. It arises from the under and lateral part of the corpus pyramidale on the fore side of the medulla oblongata by numerous filaments; it passes out by the superior condyloid foramen, and afterwards is attached to the eighth pair by cellular substance; it separates and is joined by a cross branch to the sub-occipital, or to an arch, which connects it with the first cervical: it descends between the internal jugular vein and internal carotid artery; at the root of the occipital artery, it sends down the Descendens Noni, and then crosses over both carotids behind the facial and temporal veins, and over the root of the facial artery, and is dispersed upon the middle of the tongue.

OF THE INTERNAL EAR.

Q. What parts does the *Internal ear* comprehend?

A. The Tympanum, Labyrinth, and passages leading into them.

Q. Describe the *Tympanum?*

A. The tympanum is somewhat hemispherical, separated from the external ear by the membrana tympani, and from the labyrinth by an osseous septum, in the middle of which is a promontory that forms the tympanum into an anterior and a posterior region.

Q. How many openings lead out of the tympanum?

A. *Four;* one anteriorly into the Eustachian tube, another backwards into the Mastoid cells; and two through the osseous septum, viz. the *fenestra ovalis* above the promontory leading into the Vestible, and the *fenestra rotunda* at the under and back part of the promontory leading into the Cochlea.

Q. What is the use of the *Eustachian Tube?*

A. It forms a communication between the posterior opening of the nostril and the tympanum, by means of which an equilibrium is preserved between the air in the external and internal ear; and the vibrations of the membrana tympani are facilitated.

Q. What is the use of the *Mastoid Cells?*

A. These cells have many windings and turnings which communicate with each other, and which are lined with a periosteum internum: they reflect the sound.

Q. Describe the situation and connexion of the *Ossicula Auditûs?*

A. They are four in number, and stretch across from the membrana tympani to the labyrinth: the handle of the *Malleus* is fixed to the membrana tympani, its round head is articulated with the body of the *Incus*, the long process or crus of the Incus is fixed to the *Os orbiculare*, which is connected with the head of the *Stapes*, whose base rests in the fenestra ovalis.

Q. What is the *use* of the Ossicula Auditûs?

A. They receive and communicate the vibrations of the membrana tympani to the labyrinth through the medium of the membrane covering the fenestra ovalis, much more strongly than they could have been transmitted in any other manner.

Q. What parts does the *Labyrinth* consist of?

A. Of *three;* the vestibule, cochlea, and semicircular canals.

Q. Describe the *Vestibule?*

A. It is of an oval figure, situated at the inner side of the osseous septum near the base of the stapes; it has several holes leading out of it, namely, the fenestra ovalis into the tympanum, another at the fore and under part into one of the canals of the cochlea: five behind into the semicircular canals, and four or five cribrifrom perforations into the meatus auditorius internus.

Q. Describe the situation and parts of which the *Cochlea* is composed?

A. It is situated at the fore part of the Vestibule, in the petrous portion of the temporal bone, with its base towards the meatus auditorius internus, and its apex forwards and outwards. It is composed of an axis, a lamina spiralis, and two canals or scalae, which are separated by the lamina spiralis.

Q. Describe the *Axis* or *central pillar* of the Cochlea?

A. It is situated nearly horizontally and is composed of two hollow cones, viz. the *Modiolus* and *Infundibulum* joined together by their apices; the base of the modiolus lies at the base of the cochlea, and the base of the infundibulum is covered by the apex of the cochlea, called *Cupola.*

Q. What occupies the *cavity of the axis,* or of the modiolus and infundibulum?

A. The fasciculus of the portio mollis of the seventh pair of nerves destined for the cochlea; the osseous substance of the modiolus and infundibulum is cribriform, or perforated with numerous small holes,

through which twigs of the nerve pass into the Scalae, to be dispersed upon the membrane lining them.

Q. Describe the structure and situation of the *Lamina Spiralis?*

A. It is osseous and largest at the base of the cochlea, where it winds round the modiolus; towards the circumference it becomes cartilaginous and membranous. It is composed of two lamellæ, perforated for the passage of nerves into the scalae. It winds round the axis from the base to the apex of the cochlea, and terminates in a hamulus or hook in the base of the infundibulum.

Q. Describe the *Canals* or *Scalae* of the Cochlea?

A. The one canal, commencing by an open mouth from the fore part of the vestibule, is called *Scala Vestibuli;* the other, commencing from the fenestra rotunda of the tympanum shut by a membrane, is called *Scala Tympani:* they form two turns and a half round the axis in a spiral manner, and becoming gradually smaller, they unite and terminate in the apex of the cochlea.

Q. Describe the situation and direction of the *Semicircular Canals?*

A. They are situated behind the Vestibule; the *superior* or *verticle* is placed transversely with its convex side upwards; the *posterior* or *oblique* is farther back, with its convex side backwards; and the *exterior* or horizontal is placed next the tympanum, with its curvatures nearly upon the same plane. They form about three-fourths of a circle; at one extremity is an enlargement, called *ampulla:* one extremity of the superior and of the posterior unite; and the three canals in consequence, form five orifices, which are not closed by a membrane, in the Vestibule.

Q. What covers the internal surface of all these parts of the Labyrinth?

A. A periosteum internum lines the cavities; and besides, upon the internal surface of the periosteum,

a pulpy membrane is spread, upon which the portio mollis is minutely dispersed.

Q. What fills the cavities of the vestibule, cochlea, and semicircular canals?

A. An *Aqueous fluid* similar to the aqueous humour of the eye.

Q. By what vessels is that *Aqueous fluid* effused?

A. It is secreted by the arteries of the periosteum of the Labyrinth; and it is kept in nearly the same quantity by a corresponding absorption of it.

Q. What *arteries* are sent to the Labyrinth?

A. One or two small branches from the vertebral arteries: the veins of which pass out of the labyrinth and terminate in the end of the lateral sinus.

PHYSIOLOGICAL REMARKS.

Q. How is sound produced?

A. By vibrations of the air, and is to the ear what light is to the eye.

Q. What is to be distinguished with regard to sounds?

A. The intensity, the tone, and the quality.

Q. Upon what does the intensity of sound depend?

A. Upon the extent of the vibrations.

Q. Upon what does tone depend?

A. Upon the number of vibrations in a given time, and it is divided into acute and grave; the former being formed of many, the latter of fewer vibrations. The gravest sound which the ear can perceive, is formed of thirty-two vibrations in a second; the most acute of twelve thousand.

Q. What is meant by an octave?

A. An appreciable sound, which has double the number of vibrations of another sound, is called the octave of that other. Between them there are seven sounds, called the notes of music.

Q. What is meant by fundamental or harmonic sounds?

A. When a sounding body is set in motion by percussion, it is called a fundamental sound; by attending a little, other sounds follow these, called harmonic. The quality of a sound depends upon the nature of the sounding body.

Q. What are the peculiarities of the transmission of sound?

A. Sound passes through fourteen hundred feet in a second: and still more rapidly through water, stone, or wood; it becomes fainter in proportion to the square of the distance; grave, acute, intense and weak sounds are propagated with equal rapidity without being confounded or interfering with each other.

Q. Is sound capable of reflection?

A. It is reflected in the same manner as light from opposing bodies: the angle of incidence being equal to that of reflection.

Q. How do we judge of the direction of sounds?

A. By the comparison of the impression made on our two ears; for if one be deaf, it is impossible to say in what direction sound comes. Sight, and the frequent habit of judging, assist us.

Q. How is the sense of hearing modified by age?

A By infants just born the strongest sounds are not perceived: acute sounds are first perceived, but it is a long time before the intensity, direction, and the effects of articulate sounds are distinctly noticed. It grows more perfect, as the person advances; and in old age from the diminution of the water of Cotunnius, and the insensibility of the auditory nerve, it is much weakened.

Q. What is the use of the various parts of the *External Ear?*

A. The cartilaginous pinna collects the undulations of sound, and transmits them into the meatus auditorius externus, which in its turn conveys them to the membrana tympani.

Q. What is the use of the *Membrana Tympani?*

A. It forms a complete separation between the external and internal parts of the ear: it receives the undulatory movements of the air, by which it is made to vibrate: and its vibrations are communicated by the ossicula auditus, and by the air in the tympanum to the Labyrinth of the internal ear.

Q. By what means are the membrana tympani kept in a state of tension proper for acute hearing?

A. By the muscles of the tympanum and ossicula, it accommodates itself to the strength of the impressions of the sonorous undulations; thus it is relaxed to receive strong impressions of the undulatory movements of the atmosphere, and by them too it is made tense to receive fainter and weaker impressions; while the Eustachian tube allows a free egress and ingress of air into the tympanum itself, by which the vibrating motions of the membrana tympani are kept free and easy.

Q. By what means are the undulations of sound transmitted to the whole internal ear?

A. The strongest impressions are communicated to the vestibule by the connected medium of the ossicula, while weaker impressions are communicated to the cochlea through the fenestra rotunda.

Q. What seems to be the reason of the stronger impressions being given to the vestibule, and the weaker ones to the cochlea?

A. Because, through the medium of the vestibule, the undulations of sound are communicated to the three semicircular canals, and to the scala vestibuli of the cochlea; while the undulations received through the medium of the air in the tympanum are communicated through the fenestra rotunda to the scala tympani of the cochlea only: hence the reason, why the base of the stapes is placed in the fenestra ovalis, through which the stronger impressions must be sent to the Labyrinth, rather than in the fenestra rotunda, where much less strength of impression is required.

Q. Does the *Aqueous Fluid* in the Labyrinth re-

ceive motion from the vibrations of the membrana tympani?

A. Yes; the *aqua labyrinthi*, by the vibrations of the membrane covering the fenestra ovalis, is put into undulating motions, which are conveyed through the vestibule round the semicircular canals, and along the scala vestibuli into the cochlea; while the fluid in the scala tympani, by the vibrations of the membrane covering the fenestra rotunda, is also put into undulating motions, which pass along the canal, and meet those of the scala vestibuli in the apex of the cochlea, where the two scalae of the cochlea are united.

Q. How is the *sensation of sound excited* by these means?

A. The portio mollis of the seventh pair of nerves is very minutely dispersed upon the internal surface of the pulpy membrane lining the cavities of the labyrinth with which the aqueous fluid is in contact. The delicate extremities of the nerves, therefore, receive impressions from the undulating motions of the fluid, which excite in the mind the sensation of sound.

Q. What are the ORGANIC DISEASES of the external parts *of the Ear?*

A. The pinna is sometimes divided: it is swelled in consequence of Erysipelas, Herpes, and other cutaneous eruptions: the meatus is sometimes obstructed by insects, extraneous bodies, or wax hardened and accumulated; or by Polypi growing from the membrana tympani, which is occasionally inflamed; sometimes a small phlegmon in the meatus produces ear-ache. By all which deafness is produced.

Q. What are the *Organic Diseases* of the *internal Ear?*

A. The Tympanum is sometimes inflamed and ulcerated in consequence of injuries, and acute diseases, as Small-Pox, Measles, Scarlatina, or of Lues venerea; and the Ossicula situated across it are cast out. The Eustachian tube is occasionally obstructed by previous inflammation. The Portio Mollis is some-

times paralysed. Coagulable lymph has been found in the Vestibule. Deafness, generally complete, is the consequence of these.

PATHOLOGY OF THE EAR.

OTITIS, OR INFLAMMATION OF THE EAR.

Q. What are its symptoms?

A. Violent lancinating pain, extending from the auditory canal to the throat, preventing free deglutition, increased by the head being moved, by coughing, mastication, &c.; continual humming or buzzing sound; matter at first thin, afterwards thick, of a yellowish green colour, very fetid, is discharged; this sometimes contains small pieces of bone; violent head-ache, particularly severe when the internal ear is affected, when frequently a caries of the mastoid process is induced; in this case the matter may be discharged by the eustachian tube into the pharynx, either gradually or all at once.

The diagnosis between external and internal otitis may be made by attention to the following symptoms. In the external the pain is not so deeply seated, matter is formed very soon; a few hours, or at most two days, are sufficient for its formation, and it is at first of a serous nature. In the internal affection the matter does not appear before the eighth day, and it is discharged suddenly, of a purulent quality, mixed with blood: it may flow externally by the rupture of the membrana tympani.

Q. What are the diseases with which it may be confounded?

A. The acute form may be mistaken for a neuralgia, and the chronic for affection of the cerebellum.

ANATOMY OF THE EYE.

Q. How many bones are concerned in the formation of the orbit?

A. The *Orbit* is composed of *seven bones*, namely, the frontal, sphenoid, ethmoid, lachrymal, palate, superior maxillary, and malar.

Q. Enumerate the *external appendages* of the eye.

A. The supercilia or eye-brows, palpebrae or eyelids, tarsi, ciliary or Meibomian glands, and cilia or eye-lashes.

Q. What is the use of the eye-brows?

A. They protect the eye from intense light, and prevent the sweat from irritating the eye, by intercepting it in its course down the forehead.

Q. What are the *tarsi*, and where are they situated?

A. The tarsus is a thin cartilage, broadest in the middle, and becoming narrow towards its extremities, situated in the margin of each palpebra.

Q. Describe the situation and use of the *ciliary glands*.

A. These glands are numerous, and are placed between the tarsus and the membrane lining the eye-lid: they secrete an oily or sebaceous matter, which facilitates the motions of the eye-lids, and prevents them from sticking together during sleep.

Q. Enumerate the LACHRYMAL ORGANS.

A. The lachrymal gland, caruncula lachrymalis, valvula vel plica semilunaris, puncta lachrymalia, canaliculi lachrymales, lachrymal sac, and the nasal duct.

Q. Describe the situation and nature of the *Lachrymal Gland*.

A. The lachrymal gland is situated in a sinuosity under the temporal end of the superciliary ridge of the frontal bone; is of the conglomerate kind, is oblong and a little flattened, has several excretory ducts, which terminate on the inside of the eye-lid near the outer angle of the eye: it secretes the tears which are poured out by its ducts upon the eye-ball. There is also a cluster of smaller lachrymal glands situated between the larger gland and the upper eyelid.

Q. What is the *Caruncula lachrymalis?*

A. It is a small conglomerate gland situated in the nasal angle of the eye between the palpebrae and ball; it secretes unctuous or sebaceous matter for lubricating those parts; it separates the two puncta lachrymalia, and it directs the tears into them when the eye-lids are closed.

Q. What is the *Valvula* or *Plica semilunaris?*

A. It is a fold or doubling of the tunica adnata, or conjunctiva, situated between the caruncula and ball, of a crescent form, and with its extremities towards the puncta lachrymalia; it directs the tears into them, and thus assists the caruncula.

Q. Describe the *Puncta lachrymalia.*

A. These two puncta or orifices are situated near the inner angle of the eye, the one in the upper, and the other in the under eye-lid at the extremity of the tarsus, exactly opposite to each other: each is surrounded by a cartilaginous circle, which keeps it open. They are simply the orifices of the canaliculi lachrymales.

Q. Describe the *Canaliculi Lachrymales.*

A. These two small canals run in the direction of the edges of the eye-lids, between the puncta lachrymalia and lachrymal sac, in which they terminate.

Q. Describe the situation and use of the *Lachrymal Sac.*

A. It is somewhat of an oval shape, situated just below the inner canthus or angle of the orbit, in a groove formed by the os unguis and os maxillare: it is composed of a tough mucous membrane of great vascularity, and is a little contracted at its lower end, which communicates with the nasal duct. It receives the tears from the canaliculi lachrymales.

Q. Describe the *Nasal Duct.*

A. This duct, composed of the same mucous membrane which forms the lachrymal sac, is situated in a canal formed by the superior maxillary bone and os unguis; runs obliquely downwards and backwards, and terminates by a round aperture at the lower end

of the inferior turbinated bone. It transmits the tears into the nostril.

Q. Describe the *natural course of the tears.*

A. The tears secreted by the lachrymal gland, and by the cluster of smaller glands situated near it, are poured upon the ball of the eye by the excretory ducts opening near to the templar angle: they pass across the eye towards the nose, are diffused by the motions of the palpebrae and eye-ball over the anterior surface of the eye, are absorbed by the two puncta lachrymalia, are carried by the two canaliculi lachrymales into the lachrymal sac, and thence pass down into the back part of the nostril.

Q. What is the *use of the Tears?*

A. They moisten the eye-ball, facilitate its motions, and carry off dust and other foreign bodies which may accidentally get under the palpebrae. They also express certain passions, as grief, joy, pleasure, spite.

Q. What are the chemical properties of the Tears?

A. They contain water, a small quantity of mucus, a little phosphate of soda, and pure lime.

Q. What *artery* and *nerve* are sent to the lachrymal gland?

A. The *Lachrymal Gland* receives its blood from a branch of the ophthalmic artery; and its nervous influence from a branch of the ophthalmic nerve.

Q. What are the *Chemical Constituents of the Tears?*

A. They consist of water, mucus, muriate of soda, soda, phosphate of soda, and phosphate of lime. The saline parts, however, are very inconsiderable.

Q. Is the natural course of the tears ever obstructed?

A. Yes; in Catarrh, the mucous membrane of the nostrils is inflamed; and in some severe cases, the inflammation follows up the nasal duct, thickens its membrane so as to obstruct the passage: the tears in consequence flow over the cheek at the nasal angle, irritate, inflame, and excoriate the part. This gives rise to the disease named Fistula Lachrymalis.

Q. How many Coats has the eye-ball?

A. *Three*; the sclerotic, choroid, and retina.

Q. Has it no other coats besides these?

A. Some anatomists enumerate the tunica adnata, or conjunctiva, cornea, and iris, as coats of the eye, but they are merely partial, and seem rather appendages of the other coats.

Q. Describe the *Tunica Adnata.*

A. The Adnata or Conjunctiva is a reflection of the skin from the internal surface of the eye-lids extending over the anterior part of the eye-ball, where it becomes very thin and transparent. It adheres to the subjacent parts by cellular substance, in which numerous blood-vessels are dispersed: this therefore is the common seat of Ophthalmia.

Q. What is the use of the *Tunica Adnata* or *Conjunctiva?*

A. It fixes the eye-ball to the palpebrae and socket, and prevents extraneous bodies from getting into the back part of the orbit.

Q. Describe the *Tunica Sclerotica.*

A. It is an opaque, white, elastic, fibrous membrane, of unequal thickness, possessed of little sensibility, and has but few arteries in its substance; it surrounds the greater part of the eye-ball, and terminates at the margin of the Cornea.

Q. What is the *use* of the *Sclerotic Coat?*

A. It determines the shape of the eye, supports and defends the more delicate and useful parts within it. The tendons of the muscles of the eye are spread upon, and inserted into its anterior part, they shine through the tunica adnata, which by this means has been called, near the margin of the cornea, the *Tunica Albuginea.*

Q. Describe the *Cornea.*

A. It forms the anterior transparent part of the eye-ball; it consists of thin lamellae; its convexity differs in different people, but it is more convex than the sclerotic coat, i. e. it forms part of a smaller circle than that of the eye-ball. Some anatomists have considered it a continuation of the sclerotic coat.

Q. By what means can it be proved that the Cornea is not a continuation of the sclerotic coat?

A. Its lamellated transparent structure is quite unlike the dense, hard, opaque structure of the sclerotic coat: it separates from the sclerotic coat by slight putrefaction: in the Whale, the circumference of the Cornea is received into a distinct groove in the concave margin of the tunica sclerotica; and besides, the cornea is a segment of a smaller circle than the sclerotica, and of course it is more prominent and convex.

Q. Has the *Cornea* many *blood-vessels* and *nerves* dispersed in it?

A. In its sound state, no blood-vessels are seen in it, but they can be seen when it is inflamed: its nerves are too small to be traced, but yet it possesses very considerable sensibility, and they must exist in it.

Q. What is the *use* of the *Cornea?*

A. It receives and transmits the rays of light to the humours of the eye, protects the delicate parts within, and contains the aqueous humour.

Q. Describe the *Tunica Choroidea.*

A. It is situated immediately within the sclerotic coat, to which it is connected by fine cellular membrane, blood-vessels, and nerves; it is thin, and very vascular, of a brown colour, is villous internally, and covered by the pigmentum nigrum, which seems to be secreted by the vessels of its internal surface, and lies between the choroid coat and the medullary pulp of the Retina.

Q. What is the nature and use of the *Pigmentum Nigrum?*

A. Its nature is very peculiar, being neither altered by heat, by immersion in alcohol, nor by chemical tests. It prevents the reflection of the erring rays of light, and, in consequence, the formation of a second image on the retina.

Q. Is the *Pigmentum Nigrum* always of the same colour?

A. No; it is thickest and blackest near its anterior

part; becomes gradually thinner behind, and fainter towards the entrance of the optic nerve: in old age, also, it becomes more diluted, and of a much lighter colour. In fishes, graminivorous animals, and in those which go in quest of prey in the night, the Pigment, called *Tapetum*, is of a light shining colour, to strengthen and reflect the rays of light upon the surface of the Retina, that their vision may be more perfect.

Q. Where does the *Choroid Coat* terminate?

A. It begins where the optic nerve enters the eye-ball, and adhering to the sclerotic coat terminates near to the crystalline lens under the ciliary circle or ligament.

Q. What is the *Ciliary Ligament* or *Circle?*

A. It is composed of dense cellular membrane, of a dark brown colour, in consequence of being tinged with the pigmentum nigrum: it is formed by the termination of the Sclerotic and Choroid coats, and the margin or beginning of the Iris; their junction seems the cause of the circular enlargement.

Q. What are the *Ciliary Plicae?*

A. They are folds of the choroid coat, about 60 or 70 in number across the ciliary ligament; their extremities form the Ciliary Processes.

Q. What are the *Ciliary Processes?*

A. The processes are the terminations of the plicae or striae, two or more of which form each; they float in the aqueous humour in the posterior chamber at the inner side of the commencement of the Iris: they seem to be the extremities of exhalent and absorbent vessels.

Q. What is understood by the *Corpus Ciliare?*

A. It is the blackish ring about the sixth part of an inch in breadth, adhering to the fore part of the Retina and vitreous humour; it comprehends the ciliary plicae and ciliary processes in its substance.

Q. Describe the situation and nature of the *Iris*.

A. The Iris is situated a little behind the cornea, runs transversely, is convex before, concave behind,

and perforated in the centre by the pupil; it, in short, forms a part of the same circle as the choroid coat; and some anatomists have thought it a continuation of that coat; but its evident muscularity discountenances such an idea. Its internal, or rather posterior surface, is covered by a pigment of the same colour as that of the choroid coat, called *Uvea;* when this is washed off, the Iris exhibits two sets of muscular fibres, one set disposed in the form of *radii*, which are well situated for dilating the pupil; the other fibres form a very distinct *sphincter muscle*, which surrounds the inner edge of the pupil and contracts it. The Iris divides the aqueous humour into two portions. It is furnished with many nerves, and endowed with great sensibility.

Q. What is the *use* of the *Pupil?*

A. The Pupil being a hole in the centre, or middle part of the iris, admits the rays of light to the internal parts of the eye, and allows the iris to contract and dilate itself according to the stimulus of light imparted to it.

Q. What is the *use* of the *Iris?*

A. The iris placed across the anterior part of the eye, by its circular set of fibres contracts the pupil, and excludes the rays of light when divergent, or too intense; by its radiated set of fibres, it dilates the pupil, in order to admit a greater quantity of rays: it thus regulates the quantity of light sent into the internal parts of the eye.

Q. By what stimulus is the *Iris excited to action?*

A. The movements of the Iris in man are involuntary, and depend upon the quantity of light which falls on the Retina, for it acts in sympathy with the Retina: thus when the rays of light are strong and very stimulating to the Retina, its stimulus is communicated to the iris, which instantly contracts the pupil, excludes a great portion of the light, and renders vision tolerable.

Q. May not the rays falling on the *Iris itself* in a strong light stimulate it to contraction, independent of any sympathy with the retina?

A. It is true that many rays must fall upon the iris itself, and may impart a stimulus sufficient for its contraction in the various degrees of intensity of light; but it is generally supposed that they produce no motion of it.

Q. Is not the *Iris sensible* in some cases of complete *Cataract*, when no light can be admitted to stimulate the Retina; and in some of complete blindness in *Amaurosis*, when the retina is paralysed?

A. Yes: in some cases of blindness, the iris contracts and dilates the pupil more or less according to the intensity of light presented to the eye; hence it may act more by the stimulus of light upon itself, than upon the Retina, which can scarcely be stimulated.

Q. Describe the *Retina.*

A. The Optic Nerve being tortuous at the back part of the orbit and eye-ball, invested with the Dura and Pia Mater, and removed from the axis of the eye a little towards the nose, passes by numerous fasciculi through a cribriform part of the Sclerotic and Choroid coats, and is then expanded into the delicate pulpy substance of the Retina, which forms the innermost coat of the eye, proceeds forwards between the choroid coat, and capsule of the vitreous humour, without adhering to them, and terminates at the greater diameter of the Crystalline Lens under the Corpus Ciliare.

Q. What is the *use* of the *Retina?*

A. The Retina is confessedly the seat of vision, to which all the other parts of the eye are subservient.

Q. Is there any thing particular in the *bottom of the Retina?*

A. Yes; in the centre of the Optic Nerve, where it enters the eye, the artery called *Centralis Retinae* enters, and is minutely ramified upon the inner surface of the Retina. In the back part of the Retina, too, and exactly in the axis of the eye, there is a *central foramen* of a dark colour, but becoming paler and yellowish towards its circumference. The nature of this is unknown. In the ox, however, and other large

quadrupeds, a lymphatic vessel is observed to go through it.

Q. How many HUMOURS does the globe of the eye contain?

A. *Three*; the aqueous humour, crystalline lens, and vitreous humour.

Q. What is the nature and situation of the *aqueous humour?*

A. The aqueous humour is perfectly clear and limpid, and occupies the space between the cornea and crystalline lens.

Q. Is it not divided?

A. Yes; the iris divides it into two portions; that between the crystalline lens and the iris is called the *posterior chamber*, and that between the iris and cornea the *anterior chamber*.

Q. Does the aqueous humour in the anterior chamber communicate with that in the posterior?

A. Yes: the pupil is the medium of communication through which the aqueous humour can flow from the one chamber into the other.

Q. When the aqueous humour is evacuated, can it be renewed?

A. Yes; very quickly renewed.

Q. By what vessels is it secreted?

A. By the exhalent arteries in the ciliary processes, and on the fore part of the iris.

Q. What is the use of the aqueous humour?

A. It distends the cornea, collects the rays of light into a focus in the bottom of the eye, facilitates the motions of the iris, and defends the internal parts from injurious pressure.

Q. Describe the *Crystalline Lens*.

A. It is of a lenticular form and a crystalline appearance; and though a solid, yet has been classed among the humours of the eye. It has two convex surfaces, of which the anterior is the less, and the posterior surface the more convex.

Q. Describe the *situation* and *structure* of the Crystalline Lens.

A. It is situated exactly behind the pupil, and its posterior part is imbedded in the vitreous humour. It is composed of concentric lamellae, which become more and more firm and compact towards the centre of the lens.

Q. Is the *Lens* surrounded by a *Capsule?*

A. Yes; a very pellucid capsule called *Tunica Aranea,* or *Crystallina,* surrounds the lens.

Q. Does the lens adhere to its capsule?

A. Very slightly if it adheres to it at all.

Q. What is the use of the crystalline lens?

A. To converge the rays of light in the bottom of the eye, which it does in a greater degree than the aqueous humour.

Q. Does the removal of the crystalline lens prove the above fact?

A. It does; for then the images are larger, badly defined and fainter.

Q. Describe the situation and form of the *Vitreous Humour.*

A. It is situated in the posterior part of the eye, is round externally, where it is covered by the retina; is concave before, where it receives the crystalline lens; is transparent and viscid, like the albumen ovi.

Q. Is the *Vitreous Humour* contained in a capsule?

A. Yes; it is called *Tunica Vitrea, Hyaloidea,* or *Aranea,* which sends processes into the body of the humour, forming cells that communicate freely with one another. Its capsule, near the corpus ciliare, is divided into two laminae, the external of which, adhering to the retina, passes forwards, and is inserted into the capsule of the lens; this layer has been called *Zonula Ciliaris,* the ciliary zone: the internal layer goes behind the lens and adheres to its capsule.

Q. By what name is that circular cavity denominated?

A. The *Canal of* PETIT, which lies between the ciliary zone and the capsule of the vitreous humour and of the lens; it has some transverse fibres running through it.

Q. Have these humours any blood-vessels dispersed in their capsules?

A. In the adult they are invisible; but in the foetus vessels are seen carrying red blood both in the capsule of the lens, and through the vitreous humour.

Q. What is the *use* of the Vitreous Humour?

A. It expands the coats of the eye, and gives shape to it, keeps the lens at a proper distance from the retina, converges the rays, and thus renders the focus of the rays more perfect.

REMARKS.

Q. What is meant by a ray of light?

A. A series of particles proceeding from a luminous body in a straight line, separated from each other by intervals so great that a great number may cross without interfering with each other.

Q. What is the intensity of light proportional to?

A. It increases the nearer we approach to the luminous body, and the increase of the intensity of the light is as the square of the distance diminishes.

Q. What is meant by a medium?

A. The body through which the light passes; thus the air, or water, when the passage of light through them is spoken of, are called media.

Q. What is meant by the reflection of light?

A. When a ray of light encounters an opaque body, it is reflected or turned away from its surface: when it falls upon a transparent body, it passes through and is refracted.

Q. What are the *general laws of Refraction* of the rays of light?

A. When the rays of light pass out of a rarer into a denser medium they are refracted towards the perpendicular; and vice versa, when they pass through a denser medium into a rarer one, they are turned from the perpendicular.

Q. What is the point called, at which the light penetrates?

A. That of immersion; that at which the ray of light leaves the transparent body, is called that of

emergence: if the ray enter the medium in a direction perpendicular to the surface, it continues through it in the same perpendicular direction. But if it fall on the surface at an angle, on entering it, it is bent from its course as above stated.

Q. What is meant by the angle of incidence?

A. It is that angle formed by the ray falling on a transparent surface with the perpendicular drawn through the point of immersion to the surface of the medium, and the angle of refraction is that angle which is made by the broken ray with the same perpendicular.

Q. What changes does a ray of light, entering and passing out of a medium, undergo?

A. In passing out of a rarer medium into a denser, it approaches the perpendicular to the point of contact; on the contrary it goes farther from it, when it passes from a more dense to a more rare medium.

Q. To what is the refracting power of bodies proportional?

A. To their density and their combustibility; so that of two bodies which have equal densities, that which has the greatest combustibility will have the greatest refracting power.

Q. Has the form of a transparent body no effect upon its refracting power?

A. It has no effect upon its power of refraction, but it influences the direction of the rays after they pass it; thus if the segment of a sphere be the medium, the rays incline to the perpendiculars to each point of the surface, of course each ray must approach the others, and at length meet in a point, which is the centre of the sphere of which the lens is a segment: that point is called the focus.

Q. What effect has a refracting body, as a glass with parallel sides, upon the light passing into it from a rarer medium; as, the air.

A. The light is bent in passing into it towards the perpendicular, to the point of incidence, and then on passing out of it into the air, it is bent from the per-

pendicular, and to as great a degree, as it was on passing into it; so that its course after passing it is parallel to its original direction.

Q. Is the light perfectly homogeneous, or is it composed of different rays?

A. It is composed of different coloured rays, and it is by means of their different degrees of refrangibility that we are enabled to separate them: thus, if rays of light pass through a prism of glass, and be received on a piece of paper behind it, they occupy on the paper different relative positions, one above another on the paper, shewing that they have been in their passage turned out of their way in a greater or less degree, and this is proportional to their colour; the red, being the least refrangible, occupying the top of the series formed on the paper; the orange next; the yellow next; the green next; the blue next; the indigo next; and the violet last: so that the light is not homogeneous, but is composed of a variety of different colours, and it is upon this fact, the different colours of bodies are explained: a white body reflecting all the colours; a black, absorbing all and reflecting none. A red body reflects those of that colour only; a yellow, the yellow rays only, and so on of the others; violet, the violet; blue, the blue; the other rays, with the exception of those of the colour of the body, being absorbed by the body and disappearing in it.

Q. In what position is the luminous object depicted on the retina?

A. In an *inverted position;* because all the rays of light not falling perpendicular to the middle of the crystalline lens, cross each other; i. e. those on the left are refracted to the right, and those on the right pass to the left.

Q. How then do we see things in their proper position?

A. We are supposed to acquire the real position of things by habit alone.

Q. How happens it that we do not see things dou-

ble, since the image of the luminous body is depicted upon the retina of both eyes?

A. The two eyes, in their sound and natural state, move alike; hence the image is formed exactly on the same part of both retinae, and in consequence, the vision is single. Some physiologists however, suppose that we see with one eye only at a time.

Q. When the cornea and crystalline lens are *too convex*, what happens?

A. In such an eye the focus of the rays is formed before it reaches the retina; in consequence, such people are *short-sighted*, and require concave glasses to remedy the defect of the eye, in order that they may see objects distinctly at the ordinary distance.

Q. What is the state of vision, on the contrary, when the cornea and lens are *too flat*, or when the refracting power of the humours is diminished?

A. The focus is not properly formed, therefore the object must be removed to a greater distance from the eye than ordinary to render vision perfect; which happens commonly to persons of advanced age: hence convex glasses become indispensably necessary.

Q. How is this proved, by experiment?

A. If a bullock's eye be taken and the sclerotic coat be removed from the back part of the eye, the images will be seen upon it accurately defined: if then the aqueous humour be let out, the image becomes more obscure, as the eye becomes less convex. When the cornea is removed from an eye under the same circumstances, the image does not appear to change its dimensions, but it is more obscure.

Q. How do the eyes accommodate themselves to see objects at different distances?

A. By habit, the muscles of the eye increase, or diminish the length of its axis according to the distance; and the iris too allows a greater, or smaller quantity of light to be thrown into the eye; by which means vision becomes distinct.

Q. How are the spots explained which sometimes appear in the eye?

A. They are of different kinds; thus, if a person look steadily at a white object, a black spot appears instead of the white, owing to the insensibility produced in that part of the retina on which the light coming from the white object acted; in the same manner, if the eye rest upon a white surface upon which there are black spots, the eye becomes exceedingly sensible on the points of the retina corresponding to the black spots and insensible to those corresponding to the white; objects, therefore, appear spotted: when the eye looks upon a red spot for some time, and then is withdrawn, there appears a blue in its stead, because by looking long at the red spot the retina becomes insensible to the red ray, and for this reason, that when the red ray is withdrawn from a pencil of white rays, the remaining produce a blue colour: The other colours produce effects varying in the same manner.

Q. Does one part of the retina possess more sensi ty than another?

A. Yes; its central part is much more sensible than any other part.

Q. Do we look with one or both eyes at once?

A. According to Dr. Gall with one; Magendie thinks otherwise, and adduces the following experiments to prove it; throw upon a plain surface, in a dark chamber, the image of the sun; take thick glasses each one of which presents one of the colours of the prism; put them before the eyes; if you have a good sight, and the eyes of equal force, the image of the sun, will appear of a dead white, whatsoever may be the colour of the glasses you employ; but if one of the eyes be stronger than the other, you will see the image of the sun of the colour of the glass placed before the strongest eye: the same object, therefore produces really two impressions, though the brain sees but one. On this account it is necessary that the eyes should move in harmony; if one move dif-

ferently from the other, the person squints: it is easy to produce two images of the same object by throwing the eyes a little out of the axis.

Q. How do we judge of the distance of objects?

A. It is done entirely by the mind; but, certain circumstances are necessary to the correctness of its decision; thus, two eyes are so, as is proved by the following experiment: suspend a ring to the end of a string; fit to the end of a wand a hook, that will easily enter the ring; place yourself at a convenient distance and try to introduce the hook; with both eyes open, it will be easy; with only one, it will be impossible; and if a person has his two eyes unequal in power, he will not succeed: the loss of an eye always prevents a person from judging properly of distances, and they never afterwards can judge well of them. The correctness of our ideas of distance is much influenced also by the remoteness of the object; if very near, we form a correct opinion; if more remote, we judge with less correctness, and if still more remote, we cannot form any approximation to the truth.

Q. What are the items taken into account in judging of distances?

A. The size of the object, the intensity of the light which comes from it, the presence of intermediate bodies, &c. have great influence on our decisions on this point: the frequent repetition of estimates with regard to distance of bodies has a great effect; thus, if we have been accustomed to see objects on the same plain, when we look at them from a tower or height they will appear more distant because they appear smaller, from our not being accustomed to view them. The same is true of objects seen from below when situated above us; they appear smaller.

Q. How do we judge of the size of objects?

A. By the size of the image formed at the bottom of the eye; the intensity of the light which comes from the object; the habit of estimating their distance, and of seeing the objects; so that it is diffi-

cult to judge of an object we have seen for the first time; thus a mountain which we see for the first time at a distance, in general, appears to us smaller than it actually is, because we believe it to be near to us, when it is still very remote. When objects are very remote, as the celestial bodies, they appear much smaller than they actually are.

Q. How do we judge of the motion of bodies?

A. By their images upon the retina, by the variation in the size of those images, or by the change of the direction of the light, which strikes the eyes. We should also be at rest, and the motion of the body observed must be neither too slow nor too fast; it is difficult to judge of the motion of bodies which move towards or from us when their distance is considerable, as it is only by the increase or diminution of their size that we can ascertain any change of place in them, and these are not easily appreciated, when the object is at a distance.

Q. How are optical illusions effected?

A. Either by the reflection or the refraction of light, when they occur from near objects, as in the case of mirrors; the object is referred instinctively to the extremity of the prolonged ray coming to the eye, and the comparative intensity of the light, coming from the different parts of the mirror, give the data to the mind, by which their apparent distance behind the glass is calculated. In the same manner, objects appear larger, when viewed through a double convex lens, because the quantity of light from the object thrown upon the retina is increased, and on the contrary, when the glass causes the divergence of the rays, it looks smaller: and when the surfaces of the glass are planes and not parallel, the object appears fringed with colours, as in the prism, from the separation of the rays into their elementary parts.

Q. Enumerate some other causes of optical illusion?

A. As objects appear near to us in proportion as their images occupy a considerable space in the re-

tina, or to the intensity of light which it imparts, the larger the body and the more light its surface reflects, the nearer it appears; and of two bodies placed at equal distances, the one which possesses either of these advantages will appear the nearer.

An object also viewed without any thing intermediate between it and the eye, appears nearer to us, than when there is some object partly to intercept the view.

An object seen in a strong light, when every thing around it is dark, as in the night, is always believed to be nearer than it actually is: objects also appear smaller, as they are remote, and it is by these rules that painting, and glasses of different kinds produce their effects.

Q. How is the sight modified by different ages?

A. Till seven months, the pupil is obstructed by the membrana pupillaris, which is a prolongation of the membrane of the aqueous humor, and cannot admit the rays of light to the bottom of the eye. It is, however, said, that this membrane sometimes disappears earlier. The other differences between the eye of the infant and the adult are not very remarkable. The quantity of the humours diminish as they approach to old age, when they are very much reduced in quantity. The crystalline lens becomes yellow, and less clear, till at length it sometimes becomes completely opaque.

The infant does not till the seventh month give any certain signs of being capable of regulating the motions of the eye with any degree of precision; at first it is most sensible to the red rays and the most striking colours; it begins to distinguish objects; then distances; gradually becoming more and more perfect till it begins to decline from old age.

Q. What are the causes which weaken the sight of old men?

The diminution of the humours of the eye, the loss of the transparency of the crystalline humor; and lastly, the diminution of the sensibility of the retina.

OF SURGICAL ORGANIC DERANGEMENTS OF THE EYE.

Q. What organic derangements are the EYE-LIDS subjeet to?

A. They are frequently the seat of ehronie, and sometimes of aeute inflammation; are subject to *Stye*, or a small phlegmon, to tumours and warts, to ulceration at the roots of the eilia. The palpebrae are also turned outwards, ealled *Ectropium;* or inwards, ealled *Trichiasis*, when the cilia irritate the eye-ball.

Q. What *organic derangements* affeet the CARUNCULA LACHRYMALIS?

A. It sometimes beeomes enlarged and prevents the shutting of the eye-lids, called *Encanthis:* the inflamed tumour sometimes suppurates, or remains for years in an indolent state.

Q. When the NASAL DUCT is obstructed by previous inflammation, what is the consequence?

A. The passage of the tears into the nose is prevented, the laehrymal sae is distended, and a tumour raised at the nasal angle of the eye; by pressing whieh, a yellowish viseid fluid issues from the puncta laehrymalia: sometimes the lachrymal sac is ulcerated, and the os lachrymale becomes denuded and carious. This disease is called *Fistula Lachrymalis.*

Q. What *organic derangements* is the CORNEA subjeet to?

A. To speeks growing on it; to pustules and suppuration; to opacity from lymph effused between its layers; to fleshy or fungous excrescences connected with it; sometimes, though very rarely, to partial ossifieation, or to hairs growing on it.

Q. What *organic diseases* are the COATS of the eye subject to?

A. To inflammation and subsequent suppuration.

Q. What organic derangements are the HUMOURS of the eye subject to?

A. The *Aqueous humour* is sometimes rendered turbid and opaque by the effusion of a yellowish glutinous fluid, the eonsequence of violenee, or of inflammation.

Q. To what organic derangements is the *Crystalline Lens* or its *Capsule* subject?

A. The Crystalline Lens frequently becomes opaque, soft, and rather enlarged: sometimes, but much more rarely, it becomes harder and smaller; its Capsule sometimes becomes thickened, opaque, and adheres to the Iris. This forms *Cataract.*

Q. What are the organic derangements of the *Vitreous humour?*

A. It sometimes becomes turbid in consequence of inflammation, or is secreted in an unnatural quantity, which causes the eye to protrude from its orbit; this is called *Dropsy* of the eye-ball.

Q. What are the organic derangements of the IRIS?

A. It frequently becomes inflamed, thickened, and changed in colour, by which the *Pupil* is either much contracted and immoveable, or completely closed.—When the inflammation of it is violent, lymph is effused from both sides of it, and produces opacity of the aqueous humour.

Q. What diseases is the RETINA subject to?

A. Its diseases are not well ascertained; but when the retina loses its sensibility, or becomes paralysed, it constitutes the disease termed *Amaurosis.*

Q. Is the *Eye-ball* subject to any other organic diseases?

A. Yes; its organic structure is sometimes destroyed by *Cancer*, or by *Fungus Haematodes.*

PATHOLOGY OF MUCOUS MEMBRANES.

OPHTHALMIA.

Q. What are its symptoms?

A. This affection commences by a sense of weight and tightness in the eye; it then becomes difficult and painful to move it; violent and burning heat, increased by the action of light, with a disagreeable itchiness; the conjunctiva reddens, either generally or partially, with some swelling round the cornea; the tears flow incessantly, become irritating, and ex-

coriate the cheeks; matter, at first limpid, afterwards thick and white, is discharged; vision becomes confused; violent head-ache generally complained of. When it passes into the chronic stage, the violent pains cease; the edges of the eyelids swell, turn red, and become painful; the flow of tears continues and vision is weakened, which obliges the sufferer to desist in using these organs too long at one time.

Q. What are its anatomical characters?

A. Redness, swelling, and roughness of the conjunctiva.

OF THE ANATOMY OF THE NOSE.

Q. What bones compose the Nose?

A. Fourteen; the two ossa nasi, two ossa maxillaria, and the os frontis on its upper and fore part; the os ethmoides, and two ossa unguis on its upper, inner, and lateral part; the two maxillaria superiora, two ossa palati, os sphenoides, two ossa spongiosa inferiora, and the vomer, on its under, inner, and back part.

Q. What parts are observable on the outer surface of the nose?

A. The *radix* or upper part, the *dorsum* or prominent ridge, the *apex* or point, the *alae* or moveable lateral parts, and the *columna* or under part of the septum nearest the upper lip.

Q. Describe the number and situation of the *Cartilages of the nose?*

A. The Cartilages of the nose are *five* in number: the middle one forms the anterior part of the septum narium; the two placed anteriorly form the tip, and the two posteriorly form the alae of the nose?

Q. What is the *use of the Cartilages* of the nose?

A. Their elasticity tends to defend the nose from external injuries, and to increase or diminish the opening of the nostrils, by which the current of air

inhaled through them may bring the odorous particles with more or less force against the extremities of the olfactory nerves, and thus affect the sensation of smell.

Q. What parts are most deserving of observation in its internal surface?

A. The Nares, or Nostrils, commencing from the face, extend backwards to the fauces, upwards to the cribriform plate of the ethmoid bone, and to the body of the sphenoid; are separated by the septum composed of the nasal lamella of the ethmoid bone, of the vomer, and of the middle cartilage; and they contain the ossa spongiosa.

Q. With what parts do the posterior openings of the nostrils communicate?

A. They terminate in the fauces; receive the nasal duct and Eustachian tube on either side; and communicate with the maxillary, frontal, and sphenoidal sinuses.

Q. What membrane lines the cavity of the nostrils?

A. A thick, spongy membrane, termed *membrana mucosa*, *pituitaria*, or *Schneideriana*, covers all the internal surface of the nostrils, enters also into the different sinuses, nasal ducts, Eustachian tubes, fauces, and palate.

Q. Is this *Mucous Membrane* of the nostrils furnished with many blood-vessels and nerves?

A. Yes; it is very vascular and nervous; and by being kept in a proper degree of moisture by the mucus emitted from the numerous follicles dispersed on its surface, it very considerably promotes *the sense of Smell.*

Q. What are the properties of mucus?

A. It is intended to cover the internal surfaces, as the cuticle is the outer surface of the body. It is transparent, viscous, ropy, of a saltish taste, reddens the tincture of turnsol, contains much water, muriate of potash, soda, lactate of lime, of soda, and phosphate of lime.

Q. From what sources does the *Nose* receive its blood-vessels?

A. Branches from the *facial* and *internal maxillary arteries* are distributed upon the outer parts; and branches from the internal maxillary and some twigs from the ocular arteries are dispersed upon the internal parts of the nose.

Q. What *nerves* are dispersed upon the *nose?*

A. Filaments from the superior maxillary or second branch of the fifth pair, and from the portio dura of the seventh pair, are sent to the external parts of the nose: the whole of the Olfactory nerves, and some twigs from the first or second branches of the fifth pair, are distributed upon the mucous membrane and internal parts. The olfactory nerves, very minutely spread on the surface of the pituitary membrane, constitute the *organ of Smell*, while the other nerves supply the parts with their natural sensibility.

Q. What is meant by odours?

A. They are produced by a number of fine particles which are emitted by various bodies: Some bodies do not send them off; these are denominated inodorous bodies.

Q. How are odours classed?

A. They may be classed into weak, strong, agreeable and disagreeable; others are acknowledged as fœtid, virose, spermatic, muriatic, &c.

Q. How are odours propagated?

A. By the air; though certain bodies also produce them in vacuo, and propagate them with some force.

Q. How is the sense of Smell produced?

A. By the application of these odorous particles to the inside of the nose, and the impression through the olfactory nerves, which results from it.

Q. What is the use of the nose in the function of smelling?

A. It is probably intended to direct the odours towards the upper part of the nostrils; persons, whose noses are deformed, or wanting, have no smell, and

it is remarkable, that when the nose is restored, they recover this sense.

Q. What are the uses of the sinuses?

A. Magendie supposes to furnish mucus: the other uses attributed to it are uncertain.

Q. How is the sense of Smell modified by age?

A. It commences soon after birth, and continues till old age.

Q. What is the use of the sense of Smell?

A. It is intended to distinguish the healthfulness of our food, as those aliments, in general, which have a disagreeable smell, are not proper to be eaten.

Q. Enumerate the ORGANIC DERANGEMENTS to which the *Nose* is subject?

A. In infants the nostrils are sometimes closed by a membrane stretched across them; its cartilages and bones are sometimes destroyed by Cancer, or by Lues venerea: it is exposed also to various external injuries; its mucous membrane frequently becomes inflamed and thickened, and gives origin to Polypi growing from it; its external surface is affected sometimes with an herpetic eruption, which when obstinate and corroding, is called *Noli me tangere.*

Q. Are the Sinuses connected with the nostrils the seat of organic derangements?

A. Yes; the inflammation of the mucous membrane of the nostrils is frequently communicated to that of the sinuses, and followed by ulceration and suppuration of these cavities. Sometimes tumours are found in them, accompanied with Caries and erosion of the surrounding bones. Cysts containing a watery fluid, or worms, have been found in the maxillary and frontal sinuses.

CORYZA.

Q. What are its symptoms?

A. The nares obstructed, dry, and itching, disagreeable heaviness in the frontal sinuses, dull headache, frequent sneezing, loss of smell, *lachrymation,* change of the voice, secretion of mucus at first sup-

pressed, but becomes very abundant, serous, and irritating, which causes an excoriation round the nares; it is afterwards thick, yellowish, or green, and, finally, returns to its natural quality and quantity. When it runs into a very chronic state, there is sometimes a discharge of purulent fetid matter, ulcerations having been formed.

When this affection seizes infants at the breast, it prevents them from sucking, as the nasal respiration is impeded. The disease may be easily detected by examining the parts.

Q. What are its anatomical characters?

A. Redness and injection of the mucous membrane, which sometimes is thickened and ulcerated, &c.

ANATOMY OF THE MOUTH.

Q. What soft parts compose the mouth?

A. The lips, cheeks, gums, palate, velum palati, uvula, and tongue.

Q. What membrane lines the mouth?

A. The common integument is reflected, and having become extremely thin, lines the internal surface of the mouth.

Q. Is the membrane changed when reflected into the mouth?

A. Yes; it is covered with fine villi, and constantly kept moist by Saliva and mucus.

Q. By what organs is the SALIVA secreted?

A. The Saliva is secreted by the Parotid, Submaxillary, and Sub-lingual glands on each side of the face.

Q. Describe the situation of the *Parotid Gland?*

A. It is somewhat of an oval form, situated between the meatus auditorius externus, mastoid process, and the angle of the lower jaw; it extends upwards to the zygoma, and forwards covering part of the masseter muscle.

Q. Describe the course and termination of the *duct of the Parotid Gland?*

A. From different parts of the glands various ducts

arise, which are united into one, named the *Parotid* or *Salivary Duct*, which passes from the upper and fore part of the gland transversely over the tendon of the masseter, and descending a little, perforates the buccinator and opens into the mouth opposite to the space between the second and third molaris of the upper jaw.

Q. What is the situation of the *Sub-maxillary Gland?*

A. It is smaller and rounder than the parotid, is situated on the inside of the angle of the lower jaw, between it and the digastric and mylo-hyoideus muscles.

Q. Describe the course and termination of the *Duct* of the sub-maxillary gland?

A. The duct arises from its upper and fore part, passes forwards between the mylo-hyoideus and genioglossus, along the under and inner edge of the sub-lingual gland, to the side of the fraenum linguae, where it terminates in the form of a papilla behind the dentes incisores.

Q. What is the situation of the *Sub-lingual Gland?*

A. It is of a long, flat, and somewhat oval form, situated under the anterior part of the tongue, near the inferior maxilla; it is covered by the skin of the under side of the tongue, its ducts terminate in several orifices on the sides of the fraenum near the gums.

Q. What circumstances promote the flow of *Saliva?*

A. The motions of the tongue and lower jaw in speaking and eating; the smell of savoury food; slight inflammation of the mucous membrane and throat; and the use of mercury.

Q. What is the *use* of the *Saliva?*

A. It moistens the mouth, facilitates the motions of the tongue, dilutes the food during mastication, and assists in its solution in the stomach.

Q. What are the chemical constituents of Saliva?

A. Saliva consists of a large quantity of water,

Albumen, Mucilage, Muriate of Soda, and the Phosphates of Soda, of Lime and of Ammonia.

Q. What *Organic Surgical Diseases* are the *Salivary Glands* subject to?

A. They are frequently inflamed, indurated, and considerably changed or destroyed in their structure. Purulent matter, too, sometimes collects in the cellular substance connecting the lobules of the glands, or covering them.

Q. What are the *Surgical Diseases* of the *Salivary Ducts?*

A. The ducts are sometimes divided by wounds, or destroyed by ulceration, and then the saliva flows over the cheek, and occasions a fistŭla. They are sometimes dilated and obstructed by Concretions.

Q. What is the nature of the *Salivary Concretions?*

A. They are of a whitish colour, found generally in the ducts; but sometimes in the sub-lingual gland, and occasion Ranula. They consist of Phosphate of Lime united with coagulated Albumen.

Q. What is the TONGUE?

A. It is a muscular mass, which is the principal organ of speech and of taste, and has a considerable share in deglutition.

Q. What are its *connexions?*

A. The *Tongue* is firmly connected at the root to the Os Hyoides; at the sides by membranous ligaments to the styloid processes and lower jaw; near the point by the fraenum to the parts below.

Q. Has the tongue any thing peculiar in its texture?

A. Yes; its cuticle forms vaginae, which receive the apices of the Papillae; its corpus mucosum is thicker and more moist than in other parts of the body; its cutis vera is very copiously supplied with numerous blood-vessels and nerves.

Q. How are the *Nervous Papillae* of the tongue divided?

A. Into three classes; the Papillae Maximae vel

Capitatae; the Papillae Mediae; and the Papillae Minimae vel Villosae.

Q. In what parts of the tongue are these Papillae situated?

A. The *Papillae maximae* are situated nearest the base of the tongue: the Papillae Mediae are scattered over its upper surface: the Papillae Villosae are the most numerous, and are most abundant near its apex; but they also occupy almost its whole inner surface.

Q. Has the Tongue any *mucous follicles* in its texture?

A. Yes; a great many are situated under its integuments, especially near its base.

Q. In what part of it is the *foramen caecum* of Morgagni?

A. At its root, and near its middle part, it is seen; it receives the terminations of several excrctory ducts.

Q. What *arteries* are sent to the Tongue?

A. The *Arteriae Linguales*, one on each side sent off from the external Carotids.

Q. What *nerves* are sent to the Tongue?

A. The *two Gustatory nerves*, sent off from the Inferior Maxillary of the fifth pair, are distributed upon the *point* of the tongue; the ninth pair, the Lingualis Medii, on each side terminate in its *sides* or middle parts; and the Glosso-Pharyngeus on each side is dispersed upon its *root*, and forms the Papillae Maximae.

Q. Enumerate the principal *uses of the Tongue?*

A. It is the principal organ of taste: it is the chief instrument of speech, by articulating the voice; it turns the food in the mouth during mastication, and thrusts it backwards into the pharynx in deglutition; it is also useful in sucking and spitting.

Q. What is meant by *taste?*

A. It is the impression made by sapid bodies on the tongue or organ of taste.

Q. Upon what does the sapid quality of bodies depend?

A. Principally upon their chemical qualities and their general effects upon the animal œconomy; for some bodies which are entirely insoluble, have a very decided taste, whilst others which are very soluble have none whatever.

Q. How are they classed?

A. No regular classification has been made; acrid, acid, bitter, acerb, sweet, are all mentioned, upon the general arrangement of tastes, according to their being agreeable or disagreeable, the world is agreed: a distinction which is important, because it determines the noxious or healthful qualities of bodies.

Q. Upon what circumstances does the proper exercise of taste depend?

A. Upon the healthy state of the lining membrane of the mouth, upon abundance of saliva, without which the sense is not exercised; if the mucus, saliva, &c. are deranged in their qualities, the taste becomes thereby depraved.

Q. What parts exercise the function of taste?

A. The surface of the tongue, the different parts of the mouth, and particularly its back part.

Q. What is to be observed with regard to the duration of tastes?

A. The impressions of some bodies in this respect are lasting, as aromatics; others disappear sooner; some affect one part, some another; thus acrid bodies leave an impression on the pharynx; acids, on the lips and teeth; peppermint in the mouth and pharynx. Tastes also differ in the strength of the impression; thus some are powerful and others weak, and this quality is used to take away the taste of medicines: different tastes can be perceived at the same time; a faculty which requires time and much exercise, and which is of great use in chemistry.

Q. What *Organic Diseases* is the Tongue subject to?

A. It is inflamed, swelled, and ulcerated, from the irritation of Caries Teeth, of Lues, or of Mercury:

it is sometimes covered by Aphthae; or is cracked by deep fissures; or becomes cancerous; or scirrhous tumours grow in it, and degenerate into cancer.

Q. What separates the Mouth from the *Fauces?*

A. The *Velum Pendulum Palati*, forms a partition which prevents the fluids we swallow from passing into the nostrils; and it conducts the fluid of the nostrils into the fauces.

Q. Where is the *Uvula* situated?

A. It hangs pendulous from the middle and posterior part of the Velum Palati, over the root of the tongue.

Q. How many arches does the Palate form?

A. Two on each side: the Anterior ones begin from the side of the base of the uvula, and are attached to the root of the tongue: the posterior extend also between the base of the uvula and the side of the pharynx.

Q. By what is the *Isthmus Faucium* formed?

A. By the two anterior arches of the palate.

Q. What are the *organic derangements* of the *Palate?*

A. Its soft portion is often inflamed and ulcerated in Cynanche Tonsillaris, and eroded by Lues Venerea, which also wastes its osseous portion. Polypi sometimes grow from it and hang into the pharynx.

Q. What are the *surgical organic derangements* of the *Uvula?*

A. In inflammation of the fauces and palate, it is often swelled, relaxed, and elongated. Tumours sometimes grow from it.

Q. What is the situation of the TONSILS, amygdalae, or almonds of the ear?

A. One is situated on each side of the fauces between the anterior and posterior arches of the palate.

Q. What is the *structure* of the *Tonsils?*

A. They are reddish-coloured oval-shaped glands, which have several openings on their surface, leading into cells communicating freely with each other.

Q. What do the *Tonsils secrete?*

A. They secrete a transparent mucus in their healthy state: but when inflamed, their secretion is whitish, and gives the appearance of a slough on their surface.

Q. What *organic surgical diseases* are the *Tonsils* subject to?

A. They are very subject to inflammation, and its consequences, ulceration, and suppuration; very seldom to gangrene. They are sometimes so much enlarged that food or drink cannot be swallowed, or with very great difficulty. Calculi have been found in them.

Q. Describe the situation and figure of the PHARYNX?

A. The Pharynx is somewhat of a conical figure, and is situated behind the tongue and nostrils, adhering to the bodies of the cervical vertebrae behind, and to the Larynx before; it terminates in the oesophagus.

Q. What *communications has the Pharynx* with other cavities?

A. *Six*; two of which lead upwards and forwards into the nose; the orifice of the Eustachian tube on either side encircled by cartilage, and thereby kept always open, leading into the Tympana; one forwards to the mouth, and two downwards, the anterior through the Larynx and Trachea into the Lungs, and the posterior directly down through the oesophagus into the stomach.

Q. What is the *structure* of the Pharynx?

A. Its structure is muscular, consisting of different layers of fibres; it is lined by a continuation of the mucous membrane of the mouth, perforated by the ducts of numerous glands and follicles, by which the mucus is secreted.

Q. What is the *use of the Pharynx?*

A. The Pharynx receives the food from the mouth, and by the contraction of its muscles transmits it into the oesophagus; it also assists in modifying the voice.

Q. What is the situation and structure of the LARYNX?

A. It is situated between the os hyoides and trachea at the fore part of the pharynx, and is composed of five cartilages joined together by membranes, ligaments, and muscles.

Q. Describe the situation of these *Cartilages?*

A. The *Thyroid* cartilage is the largest, and is situated at the upper and fore part; from its anterior and superior angle, a broad ligament ascends to fix it to the os hyoides; and two round ligaments join its two ascending posterior and superior processes, or cornua, to the cornua of the os hyoides: the *Cricoid* is placed below the thyroid, where it is narrow, but rises up thick, broad, and strong behind the thyroid; its under edge is horizontal, and firmly united to the commencement of the trachea: the two *Arytenoid* are small, and placed on the upper, posterior, and lateral parts of the cricoid, at a small distance from each other: the *Epiglottis* is placed obliquely over the aperture of the glottis, it stands nearly perpendicularly, and when the tongue is retracted, it is pressed down, and covers the passage into the larynx.

Q. Which of these cartilages contribute most to the tone of the voice?

A. The Arytenoid and Epiglottis. The arytenoid cartilages are triangular, a little twisted, and bent backwards; their upper extremities are turned towards each other; their posterior surface is filled up by the arytenoid muscles, their anterior is convex, with slight cavities, which are occupied by glands. They are connected to each other by the membrane of the larynx, and by muscular fibres; also to the Epiglottis by a membranous fold on each side, which form the sides of the aperture called glottis. The diminishing or enlarging of the glottis by its muscles, and the depressing or elevating of the Epiglottis by the movements of the tongue, change the tones of the voice.

Q. What *organic surgical derangements* is the *Larynx* subject to?

A. Its cartilages sometimes become ossified, and its internal membrane is often inflamed and suppurated; the suppuration takes place in the sacculi laryngis, and there is a scrofulous thickening of the surrounding parts.

Q. What is the situation of the TRACHEA?

A. It descends from the under part of the cricoid cartilage in the fore part of the neck, between and behind the sterno-hyoidei and sterno-thyroidei muscles, passes into the thorax behind the curvature of the aorta, in the posterior mediastinum, opposite to the third dorsal vertebra; the trachea divides into two branches.

Q. Describe the *structure of the Trachea*?

A. It has *four coats;* viz. a cellular, an elastic ligamentous, a muscular, and a mucous; the last of which is very irritable and vascular. The trachea is also furnished with sixteen or eighteen cartilaginous rings incomplete behind, united together by an elastic ligamentous substance.

Q. Why are the cartilaginous rings of the trachea incomplete behind, and at some distance from one another?

A. They are incomplete behind, that the trachea may naturally occupy less space; but particularly that the membrane filling up the space between their extremities may give way to the bolus of food when passing down the œsophagus into the stomach, and that the tremors of these cartilages may be more considerable in the utterance of voice. They are at some distance from each other, that the length of the trachea may be varied in raising and depressing the chin for the utterance of acute and grave tones of the voice.

Q. Has the *muscular coat two layers* of fibres?

A. Yes; the external layer is circular between the cartilages and in the back part, where the cartilages are incomplete: the internal layer is longitudinal, and the fibres are collected into bundles.

Q. Is the innermost coat of the trachea kept always moist?

A. Yes; it is every where perforated by the ducts of mucous glands and exhalent arteries, which pour out much mucus and moisture upon its internal surface.

Q. What *organic derangements* is the Trachea subject to?

A. Its internal membrane is frequently inflamed, and then throws out coagulable lymph, which is inspissated and formed into a layer of a yellowish pulpy matter, as frequently happens in *Croup*. The secretion from its glands too is much increased, and often mixed with pus, which greatly, and sometimes completely, obstructs the Trachea and its branches. Its internal membrane has been found thickened and tuberculated, and contracting its diameter for some inches. The cartilaginous rings of the trachea have been found ossified.

Q. How many *kinds of glands* are connected with the trachea?

A. Three kinds; the thyroid, tracheal, and bronchial.

Q. What are the situation and structure of the THYROID GLAND?

A. It is situated beneath the larynx upon the fore part of the trachea, covered by the sterno-thyroid, sterno-hyoid, and omo-hyoid muscles, is composed of two distinct lateral lobes, united by a transverse portion, and these are made up of smaller lobules; it receives a great quantity of blood for its size, is of the conglomerate kind; it is covered by a condensed cellular sheath.

Q. What is the *use of the thyroid gland?*

A. The thyroid gland has a granulous appearance within, and a viscid fluid has sometimes been observed in it; anatomists have hitherto detected no excretory ducts coming from it; therefore its particular use is still unknown. It has been thought to lubricate the neighbouring parts.

Q. Is the thyroid gland often subject to disease?

A. Yes, particularly in some countries: this gland becomes greatly enlarged, and constitutes the disease called Bronchocele, or Goitre.

Q. What change has been observed in the structure of the gland by Bronchocele?

A. When the diseased gland was divided, a gelatinous fluid was found in its cells, or sometimes a bloody fluid. After unnatural enlargement from inflammation, ulceration has followed, and produced a scrofulous discharge. It is sometimes, though rarely, ossified, or dropsical, or indurated, or passes into Fungus Haematodes.

Q. What is the situation and use of the TRACHEAL GLANDS?

A. These glands are numerous and but small, situated in the posterior part, and between the cartilaginous rings of the trachea; from them ducts issue, pouring their mucus upon the internal surface, which is thereby defended from the irritation of the inhaled air, or acrid particles carried in with it.

Q. Describe the situation and use of the BRONCHIAL GLANDS?

A. The bronchial glands are situated in cellular substance around the trachea, where it divides into two branches; they are of a dark purple colour, and belong to the lymphatic system, as absorbents pass through them.

END OF VOLUME I.